MACHINERY

JULY 5 1961 ONE SHILLING & THREEPENCE

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TECHNOLOGY DEPARTMENT

BRITISH CLEARING TORC-PAC *Air Clutch Inclinables*—

22, 32, 45 & 60-ton models

... *with the UNIQUE* INTERCHANGEABLE DRIVE

GUARANTEED FOR 18 MONTHS

No clutch and brake maintenance—the TORC-PAC sealed-in-oil drive unit never requires adjustment. TORC-PAC drives are completely interchangeable and stock service units can be fitted in less than an hour.

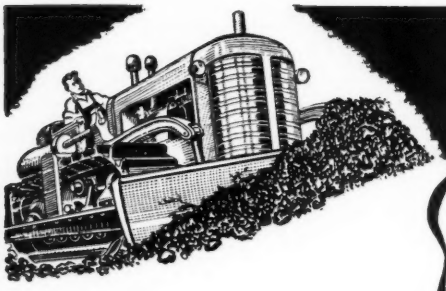
Built by **VICKERS**

ROCKWELL
MACHINE TOOL CO. LTD.

For further particulars write to :—

WELSH HARP, EDGWARE ROAD, LONDON, N.W.2. TELEPHONE: GLADSTONE 0033

ALSO AT · BIRMINGHAM — TELEPHONE SPRINGFIELD 1134/5 · STOCKPORT — TELEPHONE STOCKPORT 5241 · GLASGOW — TELEPHONE MERRYLEE 2822



Speetog
BULLDOZER CLAMP

Specially Designed to Give a Heavy Forward Thrust on a Fairly Short Stroke

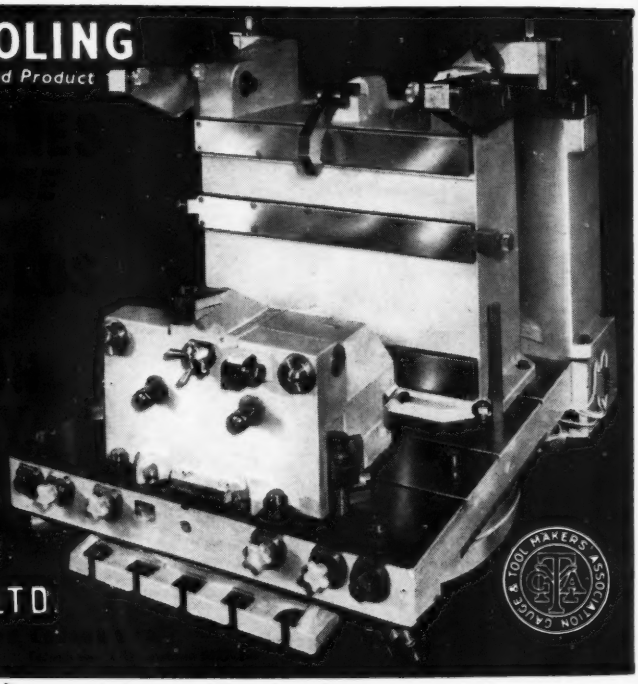
This new and powerful clamp known as the "Bulldozer" is a recent addition to the world-famous range of Speetog instantaneous clamping equipment. It provides a compact toggle-operated tool for side or end clamping in the minimum of space, since the hand lever and toggle links move in a vertical plane. Clamp is only 2¾in. high in the closed position, so that there is ample overhead clearance for milling and surface grinding operations, etc.

Patent No. 627324.

Speed Tools Ltd
VEREKER BUILDINGS, GRESSE ST., LONDON W.1. Museum 1039/1099.

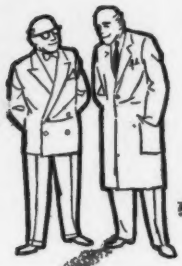
NRP 9074

PRECISION TOOLING
From Drawing Office to Finished Product



Leytonstone
JIG & TOOL CO. LTD.

RP 9074



"These Wild-Barfield furnaces do a really good job"

Where heat-treatment is concerned—are you doing the job as economically as possible? It's surprising the number of people who invest in expensive machine tools for production—and then spoil a good job in outdated furnaces. And the result? Rejects—time, money and probably customer goodwill lost. More and more people are relying on Wild-Barfield equipment. Write for full details and see how you can save by changing to modern electric furnaces.

Self-contained Electrode Salt Bath ESB 346.
Standard Model delivery ex stocks

ELECTRIC FURNACES
FOR ALL HEAT TREATMENT PURPOSES
Backed by 40 years specialist experience

WILD-BARFIELD ELECTRIC FURNACES LIMITED

ELECFURN WORKS, OTTERSPOOL WAY, WATFORD BY-PASS, WATFORD, HERTS. Tel: Watford 26091 (8 lines) Grams: Elecfurn, Watford WB71

Forst

BROACHES

We are proud to announce that the internationally famous

Forst
BROACHES
are now being made in England

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THE COMPANY WISHES TO NOTIFY CUSTOMERS THAT FROM APRIL, 1961, ALL SALES, SERVICE, ETC., OF 'FORST' BROACHING MACHINES AND BROACH GRINDING MACHINES, MADE IN GERMANY, WILL BE OPERATED FROM THE UNDERMENTIONED ADDRESS.

We welcome your enquiries for broaches of all kinds, particularly for turbine blades and stainless steel and Nimonic parts.

Forst **BROACH COMPANY (G.B.) LTD.**

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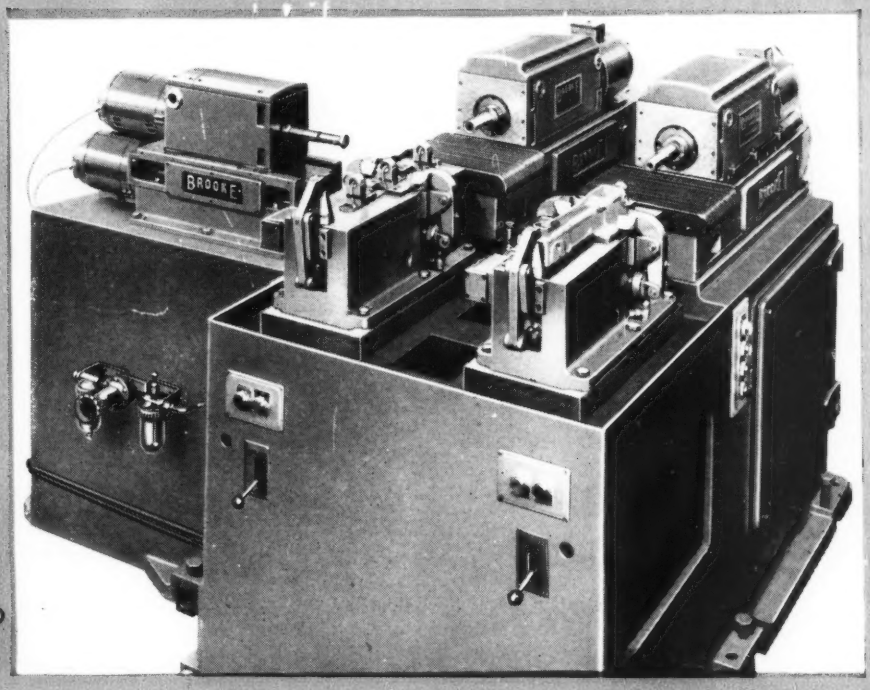
TELEX NO. 34634 FORST GB LESTER.

BROOKE

UNIT MACHINES AND UNIT HEADS

Illustrated is a Three Unit Drilling and Line Reaming Machine for processing gear box top cover components. The operations are the drilling of the longitudinal shaft hole through bushes utilising a jump gap cycle, the reaming of the same hole and the tapping of one hole in the side of the component. The main structure of the machine is a fabricated plate steel base to which one UHO and two UH1 BROOKE UNIT HEADS and two Fixtures are mounted. The Fixtures are easily loaded and clamping is effected by pneumatic means, all controls being readily available for ease of operation. The machine base houses the electrical control equipment, the coolant sump and the pump of suitable capacity.



By courtesy of NUMBER LTD

BROOKE TOOL AUTOMATION LTD.

CARDINAL WORKS, ALDRIDGE ROAD, PERRY BARR, BIRMINGHAM 22

Telephone: Birchfield 4541/2/3/4 Telegrams: UNITHEADS Birmingham 22 B

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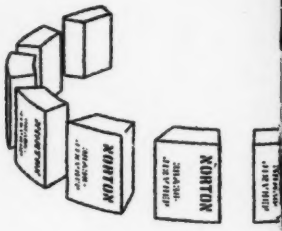
NORTON
SEGMENTS
cool and
fast grinding

Stocked in a large variety of all the most frequently used shapes (in some, there are over thirty different specifications) Norton Segments repeatedly give higher production rates and reduced grinding costs.

Norton G Bond—For all general purpose work on hard or soft steel and cast iron, and also for narrow contact work. Their free self-dressing action has inspired many enthusiastic test reports of which the following is typical:—

"Norton G Bond Segments gave longer life, better cutting action and a better finish compared with competitive segments."

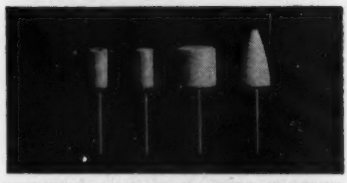
No. 12 Open Structure—for use on larger areas in broad contact grinding and for work of thin section. The open structure—with induced pores in the segments—ensures dissipation of heat and gives an easy free-cutting grind from start to finish.



NORTON B11 FETTLING WHEELS

—built-in balance and consistent action. These free-cutting Norton high speed fettling wheels are engineered to give maximum output with high wheel life. The built-in balance minimizes wheel bounce and reduces operator fatigue. Stringent grade control maintains consistently high quality performance.

NORTON MOUNTED WHEELS AND POINTS



—standard specifications now 32 Alundum abrasive. This new range of standard specifications is sharp and fast cutting. They need no breaking in and grind better, save more, on hundreds of hard-to-get-at jobs. The entirely new manufacturing processes introduced ensure the most consistent product possible.

JUST PRINTED—A WALL CHART WITH FULL SIZE DRAWINGS OF ALL MOUNTED WHEELS AND POINTS AND A SCHEDULE OF SAFE OPERATING SPEEDS. FOR THIS AND FOR LITERATURE ON NORTON SEGMENTS AND B11 WHEELS, FILL IN AND POST THE COUPON BELOW.

15 Norton and Alfred Herbert warehouses are stocked to serve your grinding needs.

Norton and Behr-Manning factories also in Argentina, Australia, Brazil, Canada, France, Germany, Italy, Northern Ireland, South Africa and U.S.A.

* NORTON ABRASIVES **GRINDING WHEEL COMPANY LTD**

WELWYN GARDEN CITY · HERTFORDSHIRE · Welwyn Garden 23484 (15 lines)

ENQUIRIES ALSO TO ALFRED HERBERT LIMITED, COVENTRY. COVENTRY 89221

* Registered Trade Mark of Norton Company U.S.A.

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PLEASE SEND ME:
☐ MOUNTED WHEELS AND POINTS CHART
☐ Leaflet "Segments for Surface Grinding"
☐ Leaflet "High Speed Rough Grinding"

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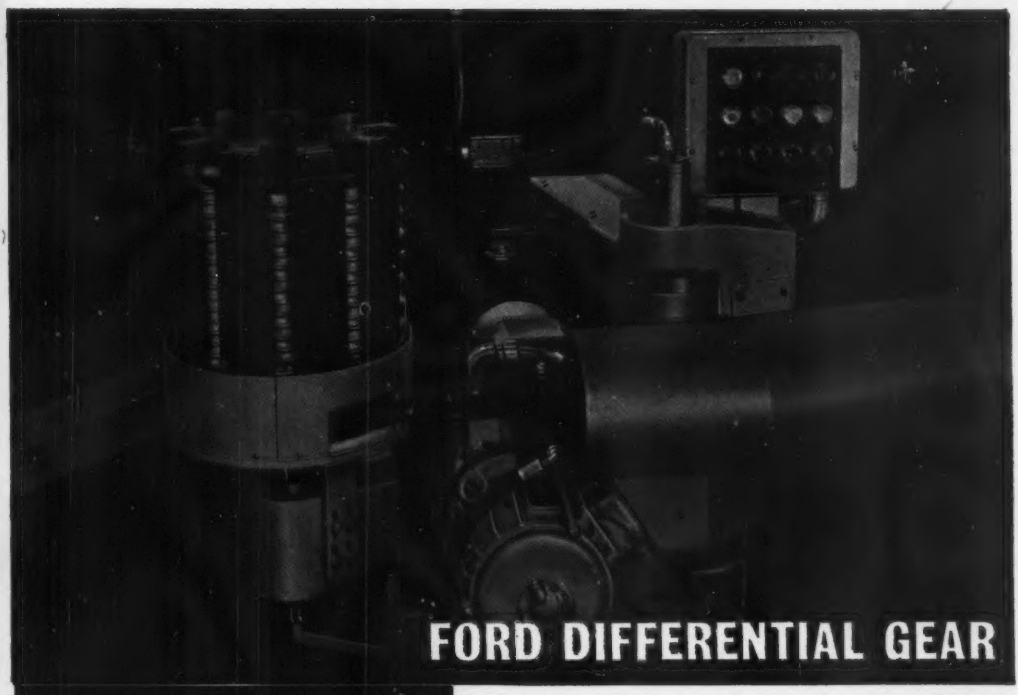
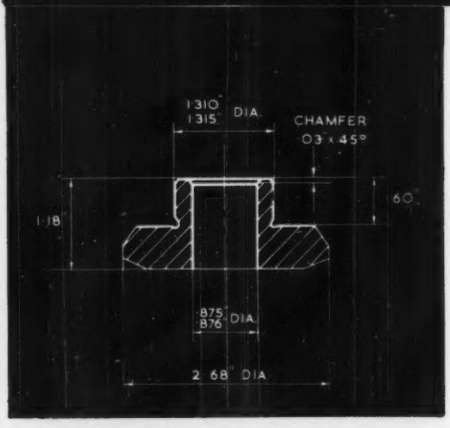


FORD DIFFERENTIAL GEAR



MACHINED IN 24 SECONDS WITH AUTOMATIC LOADING

The photograph shows the automatic loader fitted to a No. 6 Ryder Verticalauto supplied to The Ford Motor Company Limited. It is used in the production of differential gears, which are finish-bored, turned and faced at the rate of one component in 24 seconds. The magazine carries enough components for a forty minute run.

Automatic loading can be fitted to all sizes of Ryder Verticalautos.

Ryder

VERTICALAUTO

Thos. Ryder & Son, Limited, Turner Bridge Works, Bolton, England.
Makers also of single spindle Rydermatics and Piston Ring Lathes.

When answering advertisements kindly mention MACHINERY.

this is a "multisize" collet

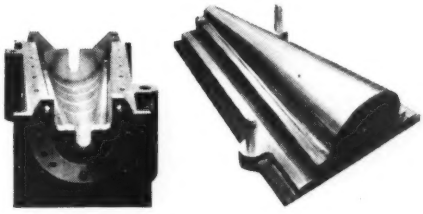
It has a stepless gripping range of 1/8", equivalent to the gripping capacity of at least ten spring collets. Sizes are available covering a total range from 1/16" to 2½". It is the heart of the "multisize" collet system of workholding and toolholding.
All "multisize" collets in any type range are interchangeable.

to find out more about "multisize" write or phone:

F. BURNERD & CO. LTD. MOORSIDE WORKS, WINCHESTER, ENGLAND.
London Office: 5, Balfour Place, London, W.1. *Telephone Winchester 5195*

Save on time and cost of cold and hot forming operations by using HARPER 'CAST-TO-FORM' TOOLS

If you are forming metals, plastics, rubber, glass fibre or asbestos compounds you can save time and money. Harper 'cast-to-form' tools need minimum finishing before putting into service and first quality materials ensure long life. We can offer exceptionally good delivery.



Showing the high finish obtainable on polished tools used for production of six-feet long asbestos components.

Fully descriptive technical leaflet T.3 on request from:

JOHN HARPER & CO. LTD., WILLENHALL, STAFFS.

WILLENHALL 124 (5 lines) · FOUNDED 1790 · LONDON: ABBey 5906/7

MANCHESTER: BLAckfriars 0295 · POOLE FOUNDRY LTD: POOLE 212

Makers of the famous Beatrice Oil Heaters and Harper Housewares

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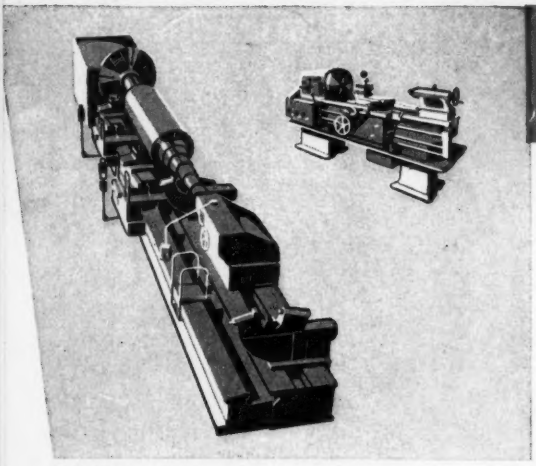
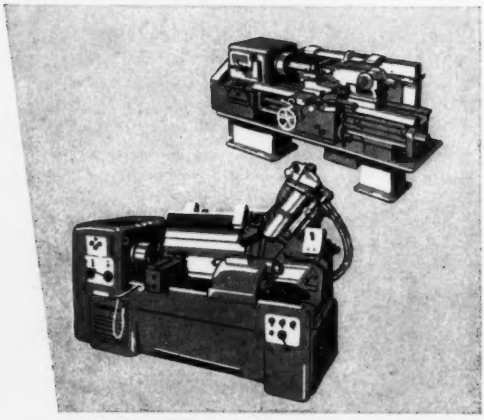


HEYLIGENSTAEDT
GIESSEN

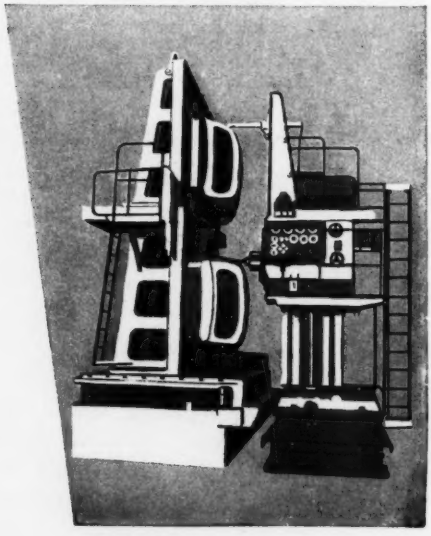
Lathes

Heavy-duty centre lathes - Universal lathes - Heavy lathes - Facing Lathes - Turning machines with rotating tools - Cylinder turning and boring lathes - Lathes with sliding gap bed - All lathes optional with hydraulic and electric copying attachments.



Copying lathes

HEYCOMAT copy-turning machines, semi- and fully automatic, also with automatic loading device - HEYCOP production copying lathes - Special copy-facing lathes.



Copy-milling machines

Automatic copy-milling machines with electric tracter control - Table models with horizontal and vertical milling spindle - Floor models with horizontal milling spindle.

Bishop, Eaves & Sons, Ltd.

868, Alum Rock Road.
Birmingham, 8

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ABWOOD

UNIVERSAL MACHINE VICES AND COMPOUND ANGLE TABLES FOR ALL ACCURATE WORK

Suitable for jig boring, grinding, milling and shaping machines. Movements are fully indexed through 360° in the horizontal plane and 90° in the vertical. Any combination of angles can be obtained.

Available with 4" and 6" jaw widths. Accurately indexed for angular work with spot sight and knife edge for register. Note the clean design, low height and rigid mounting. Angles cannot alter once the clamps have been locked.

Universal table fitted with interchangeable table. Changeover from circular to rectangular table is readily effected by loosening clamping bolts.
Available in two sizes. Circular 6" and 8" diameter. Rectangular 8" x 6" and 10" x 8".

ABWOOD

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Telephone : Dartford 25271 (5 lines)
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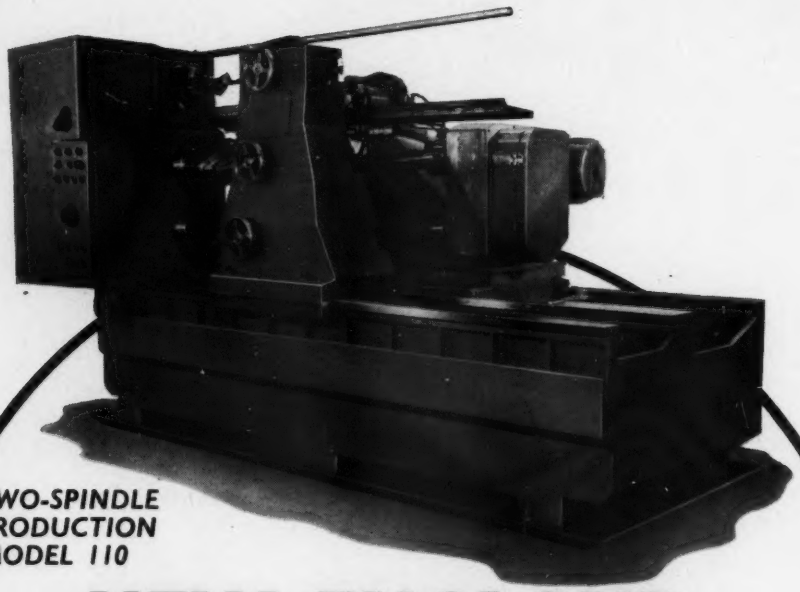
UV2



TWO-SPINDLE PRODUCTION MODEL 110

NEW ENGLAND
AIRFOIL MILLING MACHINE

This newly-designed two-spindle production airfoil milling machine is an extremely large, rugged, heavy and high speed machine, capable of handling the stock removal, in one cut, for either very rough forgings—or from bar stock—to the finished shape.

The machine is particulary applicable for economical production of medium and large steam turbine blades, industrial gas turbine blades, and large compressor and turbine blades for jet engines.

Capacity permits the milling of blades up to 12in. chord width by 60in. length of foil shape.

Designed and manufactured by The New England Machine and Tool Company of Connecticut, and sold by Pratt & Whitney Company, for whom we are Sole Agents in the United Kindom.

Also available Model 102—6in. and 107—12in. Electronic Airfoil Milling Machines.

For full details see the new Buck & Hickman Ltd., Machine Tool Catalogue, Pages 61/62.

BUCK & HICKMAN LTD.

Machine Tools. **Otterspool Way, Watford By-Pass, Herts.**
Head Office. **P.O. Box 74, Whitechapel Road, London, E.1.**
Branches. **Alperton, Birmingham, Bristol, Glasgow, Leeds, Manchester.**

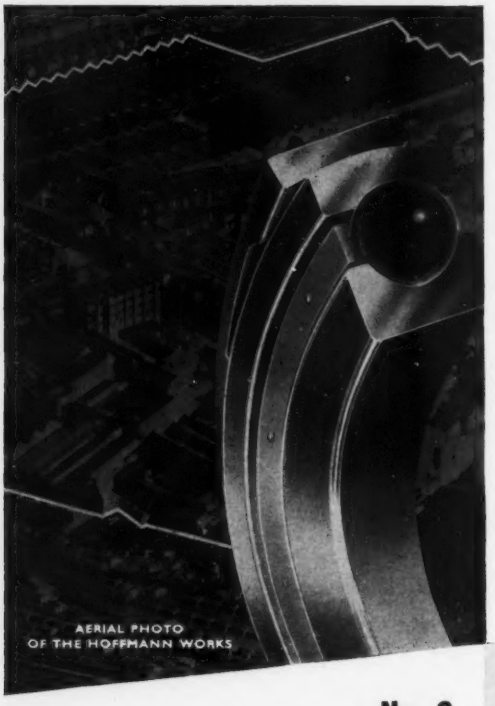
let us "HANDLE" your machines

WM. WHITELEY & SONS, LTD. *incorporating* **J. CHARLESWORTH**

(MACHINE TOOL DIVISION) PROSPECT IRONWORKS, LOCKWOOD, HUDDERSFIELD, YORKS.

Telegrams: Drying, Huddersfield Telephone: Huddersfield 4410/11

makers of Machine Components since 1854



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KNOW YOUR BEARINGS

No. 6

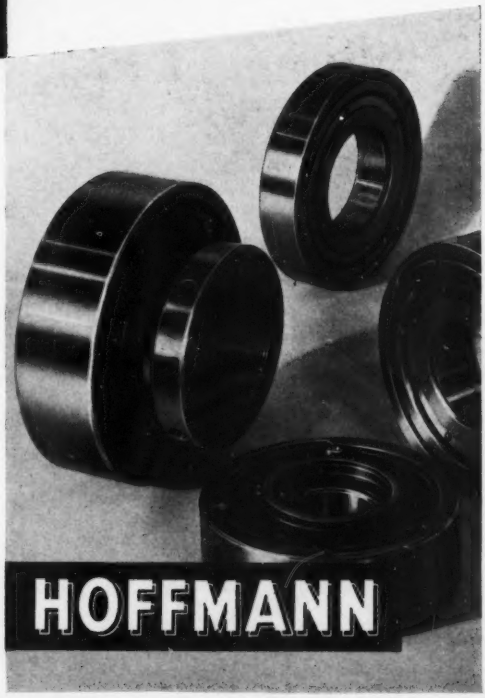
The Single Row Self-Aligning Ball Journal

This extremely useful ball journal adjusts itself to malalignment. It is of the same internal construction as the ball journal and has the same load capacity. The self-aligning feature, independent of the rolling elements, is provided by the outer race being ground to spherical form and fitted within a shell housing of corresponding form.

The end covers, also sphered, move with the bearing, enclosing it, and maintain a fine running clearance about the rotating parts.

It is supplied with taper clamping sleeve and nut or with parallel bore for fitting direct to the shaft.

HOFFMANN SINGLE ROW SELF-ALIGNING BALL JOURNALS are made in the following series:- IN INCH SIZES—LIGHT AND MEDIUM with taper sleeve and nut or with parallel bore

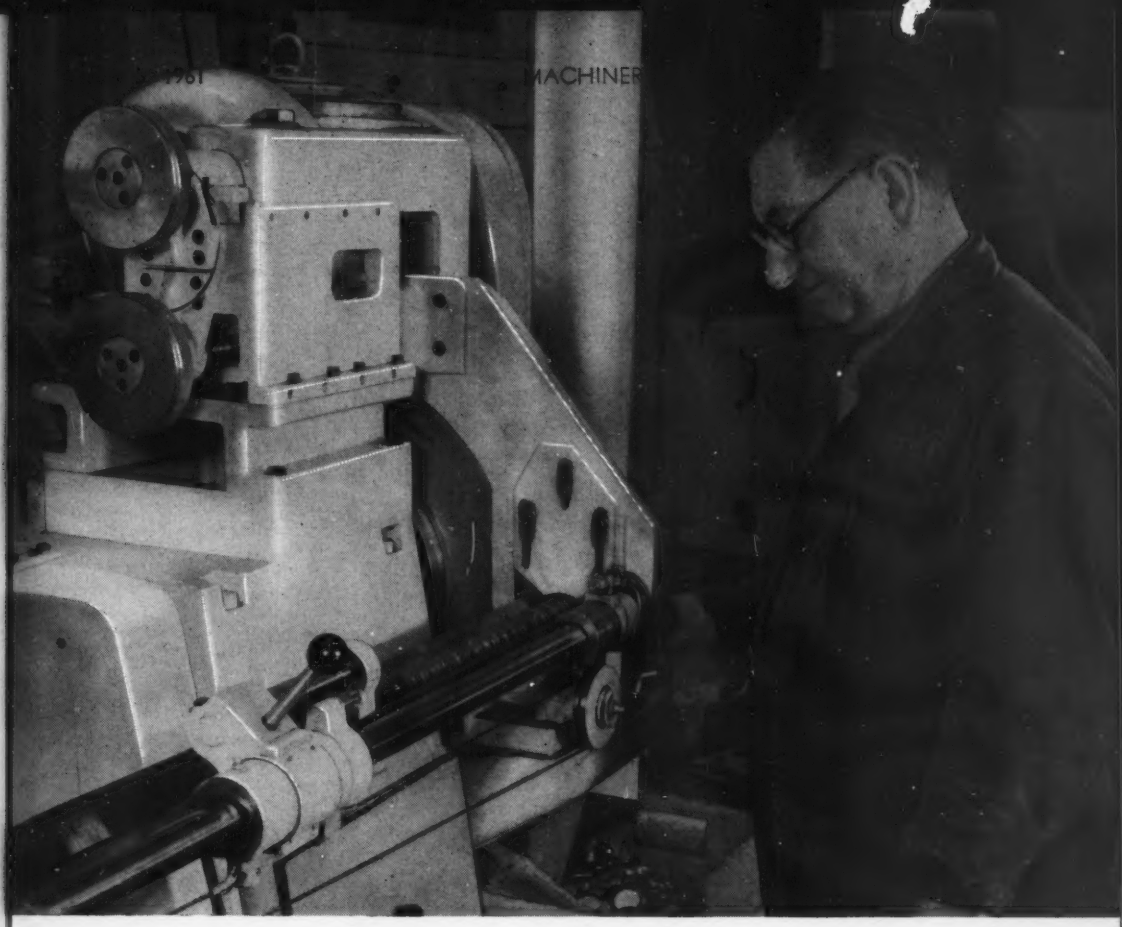


HOFFMANN

Manufacturers of precision ball and roller bearings—established 1898

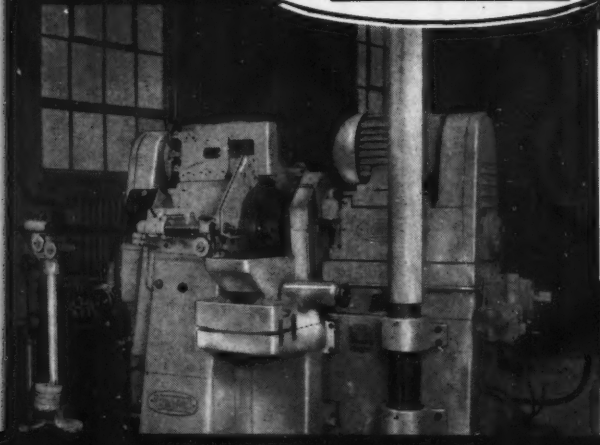
THE HOFFMANN MANUFACTURING CO. LTD. CHELMSFORD, ESSEX

TELEPHONE: 3151 TELEX No. 1951



finest..fastest production machines of their typ

DUPLEX **ROWLAND** SURFACE GRINDERS



FINISHES BOTH SIDES SIMULTANEOUSLY

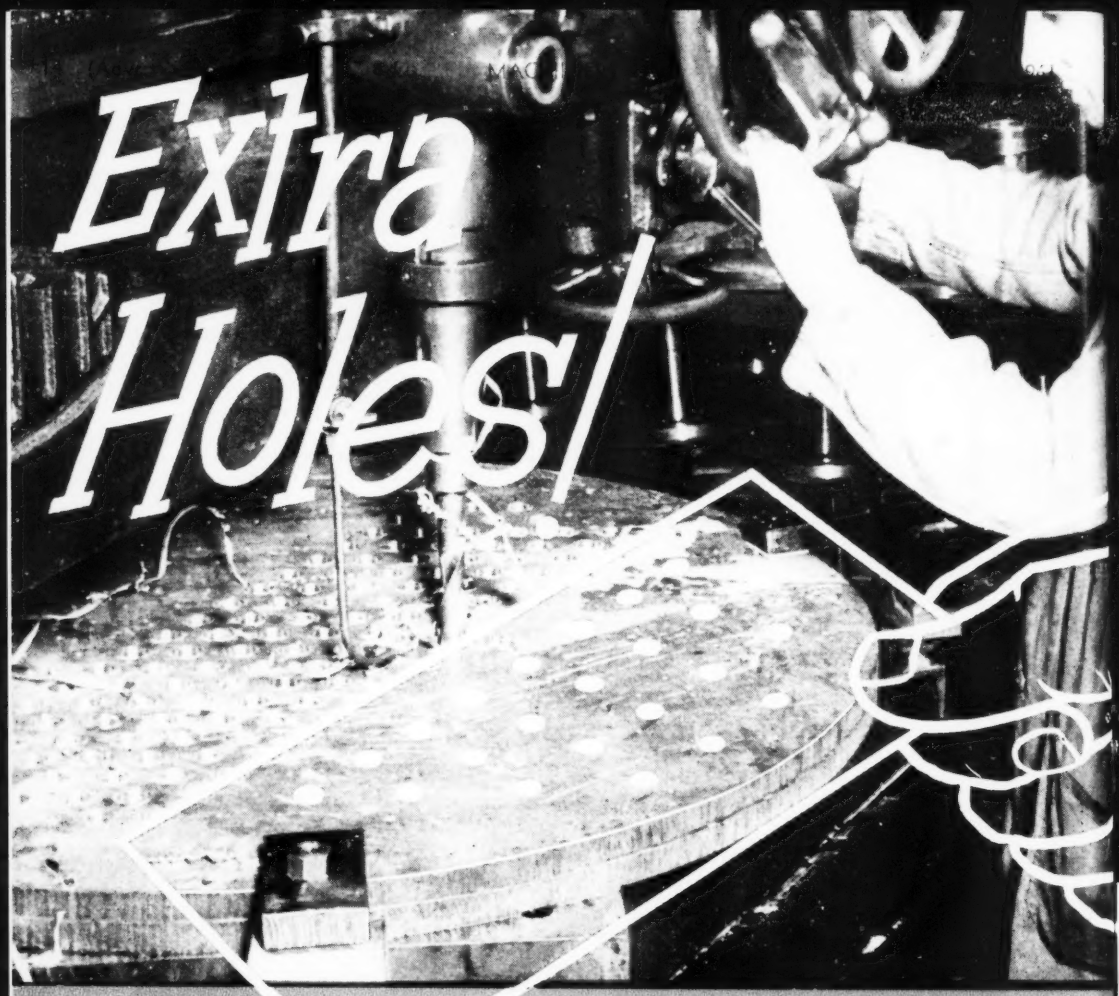
. . . . CUTS COSTS IN HALF

This machine, recently installed in the works of Spirax-Sarco Ltd., is seen simultaneonsly grinding both faces of small circular components to exceptionally fine limits at extremely high rates of production.

F.E.ROWLAND & CO.LTD.

PHONE: HEATON MOOR 3201/2/3
GRAMS: HEROIC REDDISH

CLIMAX WORKS, REDDISH, Near STOCKPORT



...With the compliments of

DORMER

MAKERS OF THE FINEST TWIST DRILLS
—BY ANY STANDARD

Exceptional performances from an odd drill in a batch are of little value to the regular user of Twist Drills. Multiple drilling, repetitive drilling, production drilling, demand consistency in the working life of each tool, therefore the capacity of obtaining extra holes from every drill is an obvious advantage. The manufacture of DORMER Drills is keyed to this very principle.

THE SHEFFIELD TWIST DRILL AND STEEL COMPANY LIMITED
SHEFFIELD **ENGLAND**

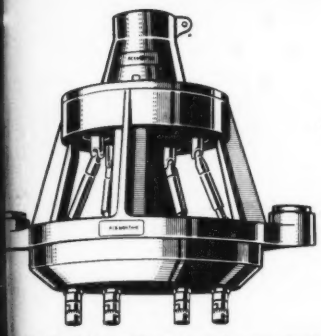
DORMER TOOLS ARE OBTAINABLE FROM YOUR USUAL ENGINEERS' MERCHANTS

VISIT OUR STAND NO. 7404 • 7th EUROPEAN MACHINE TOOL EXHIBITION, BRUSSELS • SEPTEMBER 3 - 13, 1961

PRECISION MULTI DRILLING

FIXED & ADJUSTABLE CENTRE HEADS

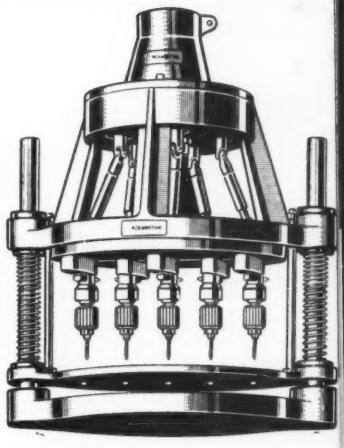
UNIVERSAL COUPLING DRIVE TO SPINDLES



ndle Fixed Centre Head with collet type chucks.

Size	Capacity	Max. PCD	Min. Centre Distance
1	$\frac{5}{16}$"	7"	$\frac{13}{16}$"
2	$\frac{1}{2}$"	11"	$1\frac{9}{16}$"

ndard attachments are made in two sizes and are supplied complete with Guide lar Housings. Each head can be fitted with up to eight spindles with either Collet cks, Jacobs type drill chucks or Morse taper sockets. Additional spindles and various ptations can be made to suit particular requirements. Quill adaptor sleeves are le to order.



5 Spindle Head with pressure plate and base.

JOHN ACKWORTHIE LTD

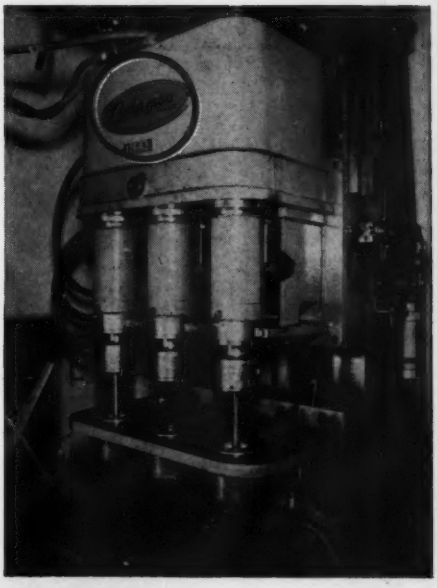
Telephone: Kenilworth 1530 (P.B.X.)

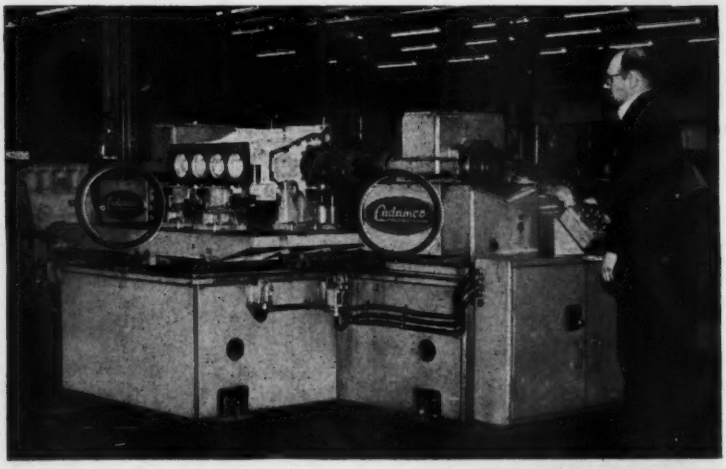
Cadamco

The mark of leadership in the design and manufacture of modern special-purpose machines

Machines that are hard at work on current production are the best evidence of our ability to provide the right design and a high standard of manufacture.

If you are seeking an enthusiastic 'out-of-the-rut' approach to your machinery problems you will find us keen to help you at a competitive price.





A multi-spindle cavity boring machine specially manufactured by us for the War Office. This machine has a fully automatic cycle and bores a number of shell cavities simultaneously to two diameters.

We designed and manufactured this cylinder block milling machine for Caterpillar Tractor Co. Ltd. It enables twelve bearing boss faces of a Diesel engine cylinder block to be completed in one operation.

CYRIL ADAMS & CO. LTD.,

155 East Barnet Road, New Barnet, Herts. Telephone: Barnet 2335/6/7

Designers and Manufacturers of Jigs, Fixtures and Special-Purpose Machine Tools

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Tapershank performance... Jobber's cost

Clarkson TaperFast System

For you TaperFast means an immediate reduction in your drilling expenditure. For every size of Jobber Drill you use from $\frac{1}{8}$in.—$\frac{1}{2}$in., A—Z or 1—31, you can now use a Tapershank Drill, but it will cost you no more than you are now paying for your Jobbers. This means that you can have Tapershank performance at Jobber's price.

If you want to know more about this new advance in drilling technique, all you have to do is to write or phone your nearest Clarkson Service Centre.

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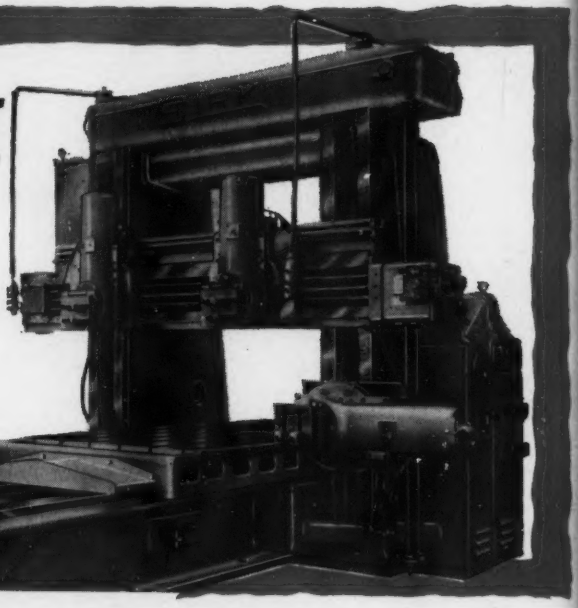
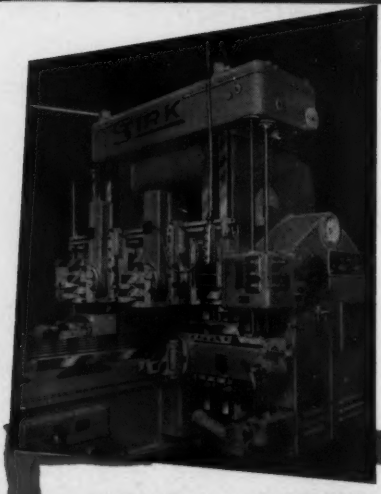
STIRK

PLANERS SET THE STANDARD





The modern Stirk Planer, with built-in electrical equipment, possesses many distinctive features which make it one of the world's finest planing machines.
The easy control and fine accuracy of the modern planing machine is due in no small measure to the continuous development of Stirk Planers. For more than fifty years Stirk Planers have influenced the design and set the standard by which others are judged.

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961

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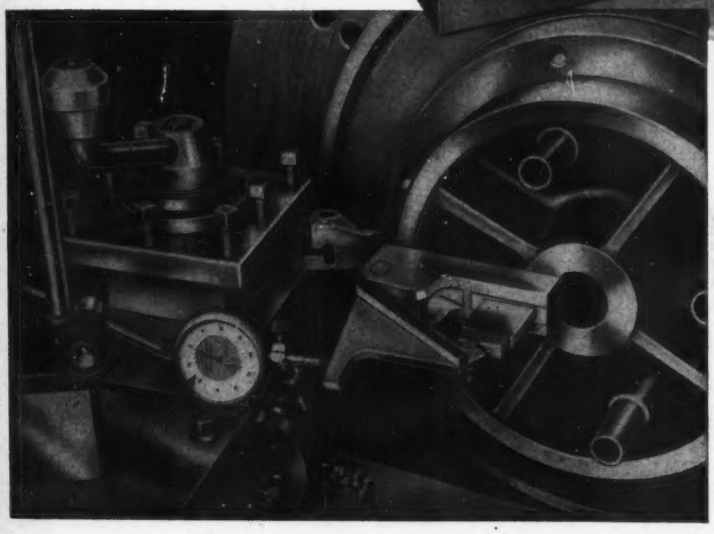
'HABIT'

Magnetic Sine Bar

LEAVES BOTH HANDS FREE FOR ACCURATE SETTING!



Essential for the rapid angular setting of machine tables, slides, toolholders or work to extreme limits of accuracy without using makeshifts. Permanent magnets incorporated in the base provide a positive lock-on to the work-piece or machine so leaving both hands free for setting operations.

★ *Make it a* **'HABIT'** *to be accurate!*

The Habit Magnetic Sine Bar is manufactured from the finest hardened materials and is lapped on all gauging faces. Angular setting problems are solved with an accuracy not possible with Vernier scales and protractors.

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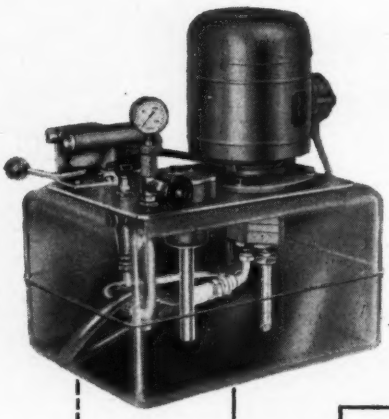

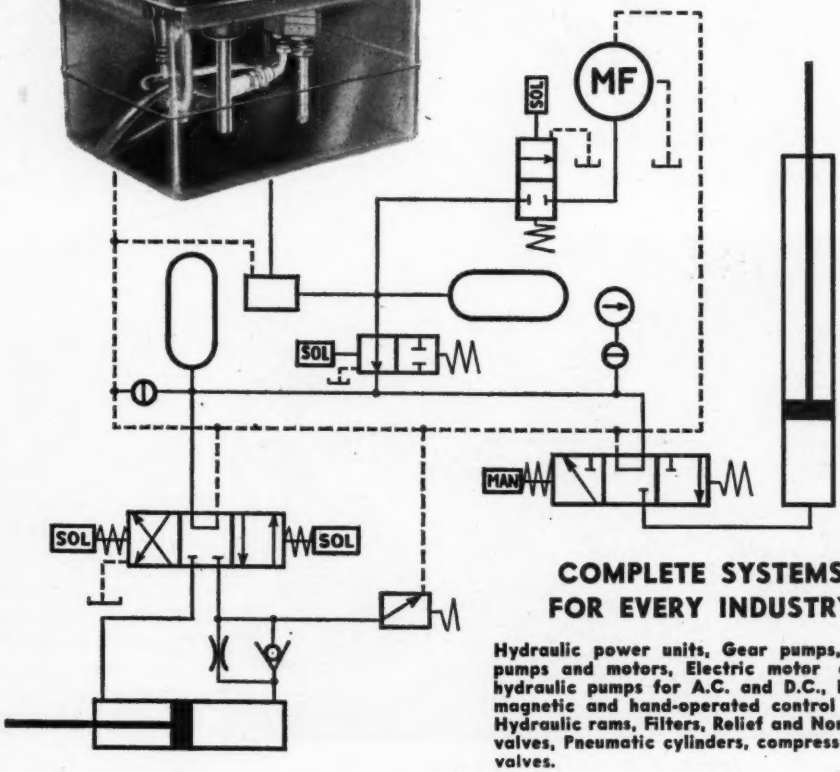

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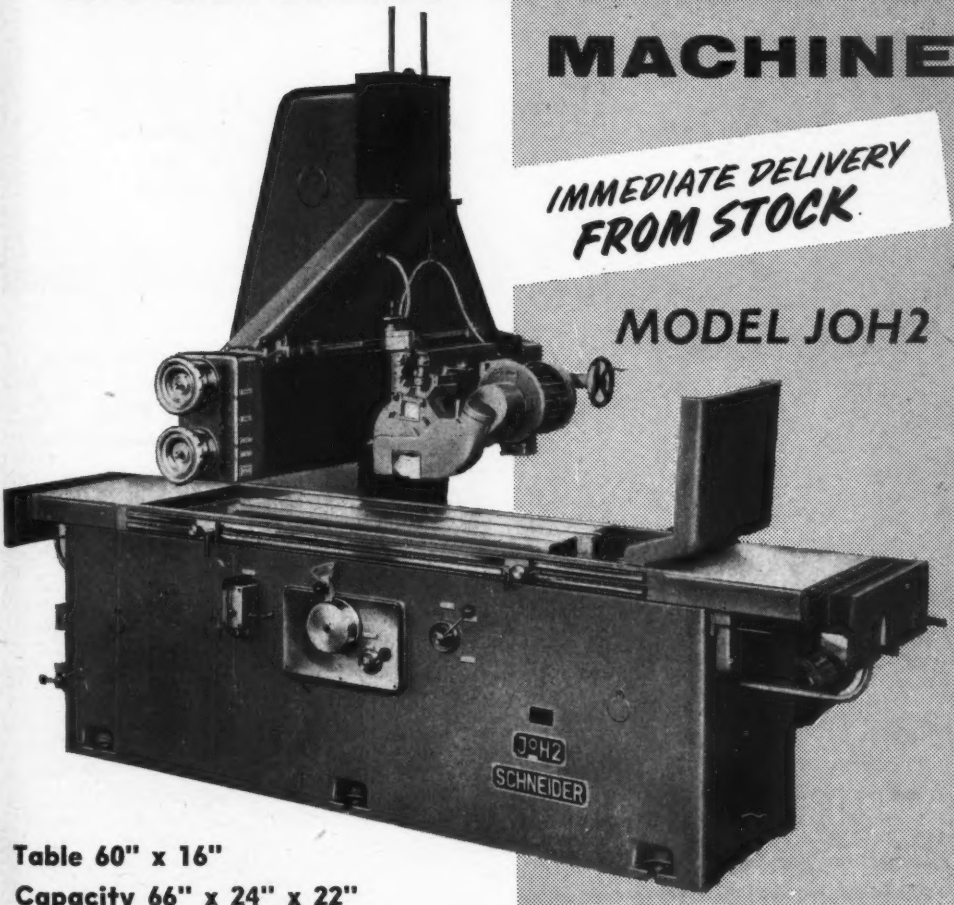
SURFACE GRINDING MACHINE

IMMEDIATE DELIVERY FROM STOCK

MODEL JOH2



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Capacity 66" x 24" x 22"

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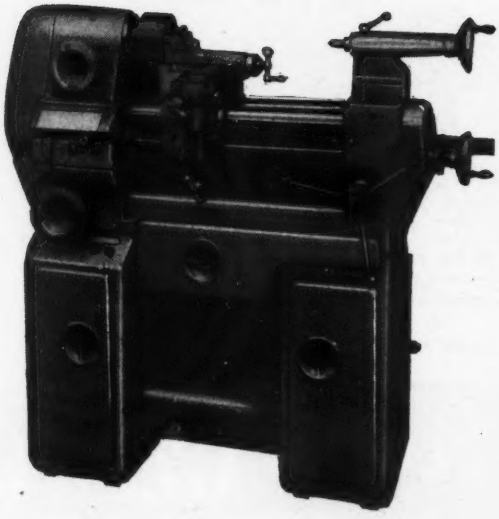
B2

Kneller Multi-Purpose Lathes in the Development Department of Hymatic Engineering Co. Ltd., Redditch

KNELLER

MULTI-PURPOSE LATHES

Although termed lathe, this versatile machine has additional characteristics such as the tailstock unit can be traversed by hand or mechanically with a range of feeds. A vertical movement to the saddle table providing characteristics of a horizontal boring machine, with thread cutting facilities. A facing slide is supplied to perform this operation. This machine is an essential for toolrooms and research departments, where pre-production and small quantities of accurate and intricate machining are required. Also being used in Technical Colleges for educational purposes.



KNELLER (Instruments & Tools) LTD., LONDON ROAD, DAVENTRY Tel: DAVENTRY 446

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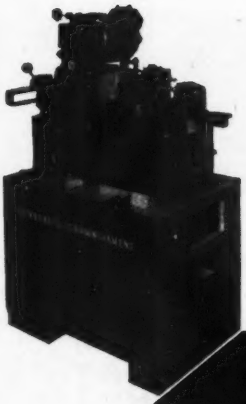
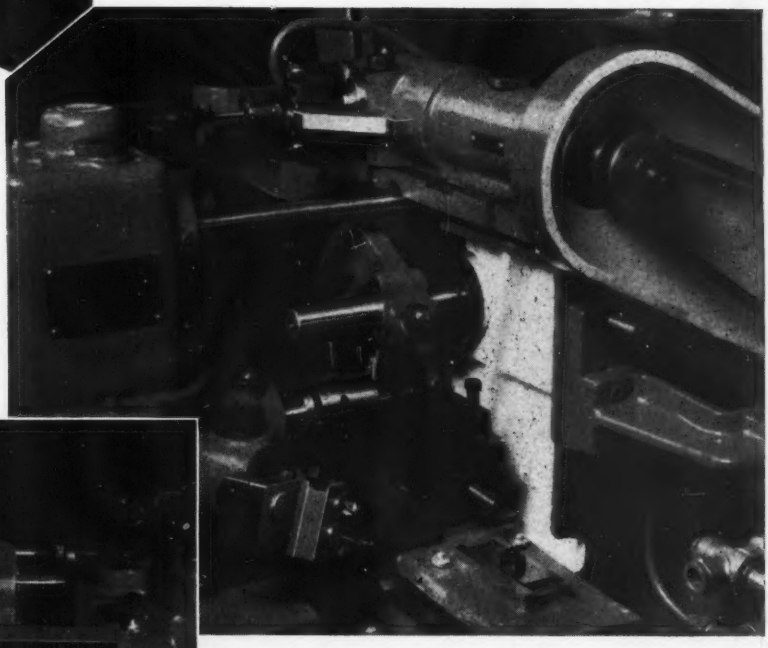


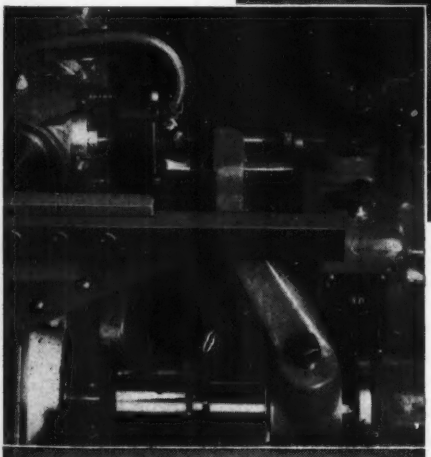
designed for economical high production of small components

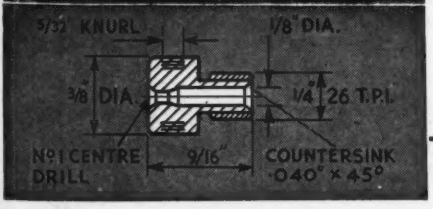
BROWN & WARD

AUTOMATIC BAR MACHINES



A Brown & Ward ¾" 4-operation machine producing a brass nozzle in 5·7 secs. The machine is fitted with a rear end drilling attachment, as shown in the close-up. A transfer arm moves the nozzle as it is parted-off from the bar, to the attachment for drilling and chamfering the small hole simultaneously with the machining of the next piece.





An extremely wide range of work can be economically produced on Brown & Ward Single-Spindle Automatics. By virtue of their simplicity in setting-up, operation and maintenance and by their low cost compared with more complex machines, they ensure high-production repetition work at lowest possible cost per piece.

Range of machines for bar work up to 1¼" dia. x 4½".

Automatic stud machines also available.

ALFRED HERBERT LTD., COVENTRY

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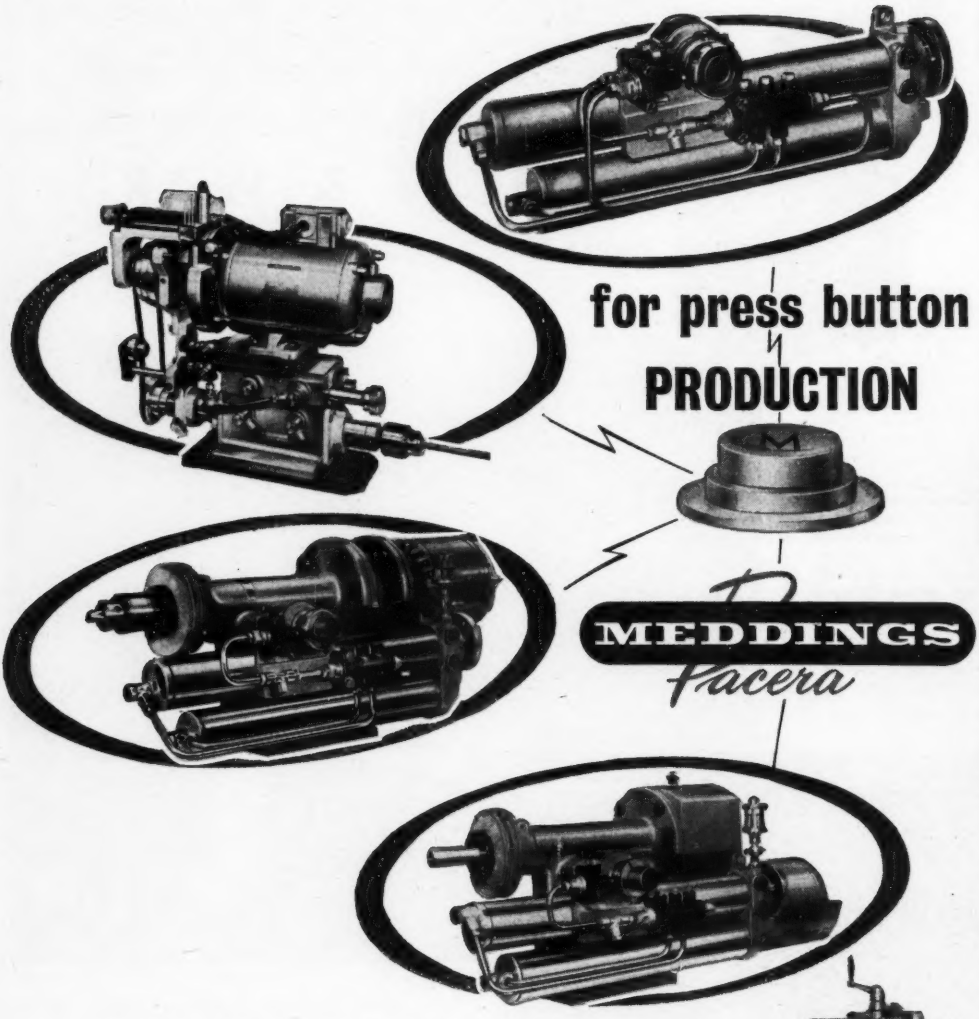
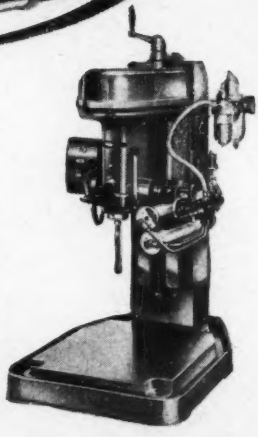


for press button PRODUCTION

MEDDINGS *Pacera*

The fitting of Pacera/Maxam Air Hydraulic Feed Units to your Drilling Machines will provide automatic, effortless operation, and in many cases will enable one Operator to control two, or even three machines—he has only to load and unload the fixtures. Drilling Machines complete with Feed Units are available from a comprehensive range to meet your particular requirements. Unit drilling and tapping Heads of ¼" and ½" capacity at reasonable cost now enable you to introduce press-button efficiency in your production line. Why not obtain full details *now* — *Write to the Manufacturers*



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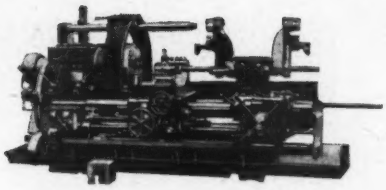
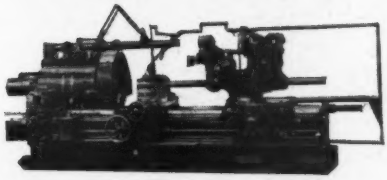
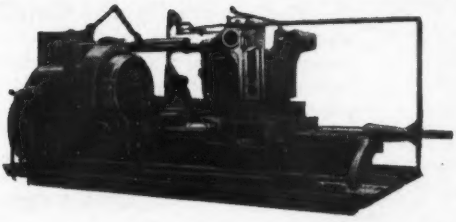




The Herbert range of powerful and rigid lathes for heavy cuts at coarse feeds on all work up to 36" swing; unsupported light work up to 45" swing.

Have advantages common to Herbert Capstan Lathes—the power, speeds and feeds to use carbide tools, ease of setting-up for economical machining of small batches, fast cutting times, high and consistent accuracy and excellent finish.

On this Herbert No. 14/36 Combination Turret Lathe at the Caterpillar Tractor Co. Ltd., Newcastle, a 50 h.p. motor and Ardoloy tools permit heavy metal removal when machining a 34in. diameter rim collar from a steel forging.



7 sizes: manufacturing, cross-sliding turret and combination turret types.

ALFRED HERBERT LTD., COVENTRY

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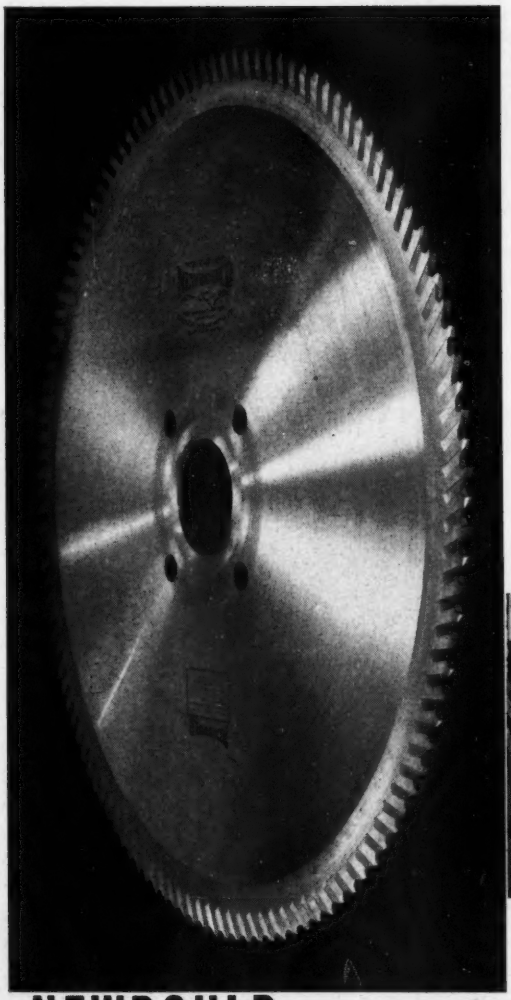
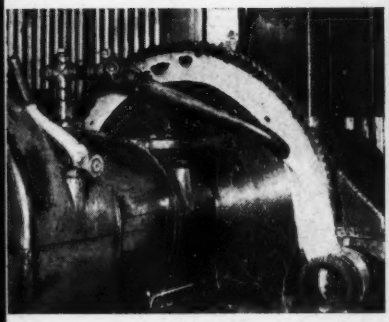


LONG LIFE ECONOMICAL MORE EFFECTIVE SAWING



The NEWBOULD segmental saw

The scientific tooth design of the NEWBOULD segmental saw enables ferrous and non-ferrous metals to be cut at maximum feeds and speeds. Alternate roughing and finishing teeth produce free-curling, easily-cleared chips, reducing friction, minimising power wastage.

Made in sizes from 11" to 60" diameter with tooth segments of SABEN EXTRA high speed steel for maximum life between re-grinds.

Details on application.

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SPRAY BOOTH MAINTENANCE CUT BY 90%

BULLOWS NOPUMP SPRAY BOOTH

- Longer time between clean-outs
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- Lack of adhesion of deposits
- Smooth, easily cleaned surfaces
- Low first cost due to simplicity
- Occupies minimum space

IN EVER-INCREASING DEMAND. *See over*

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NO FILTERS
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NO NOZZLES

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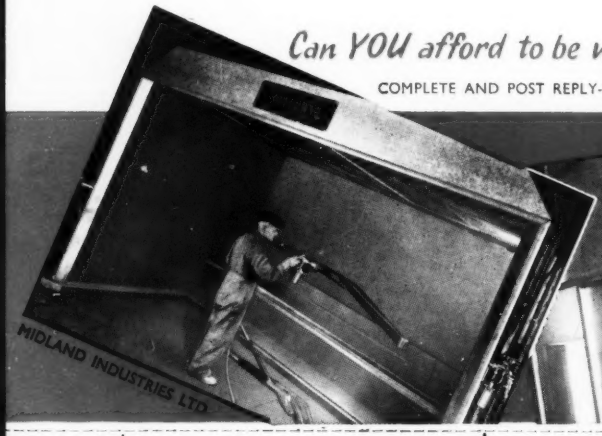

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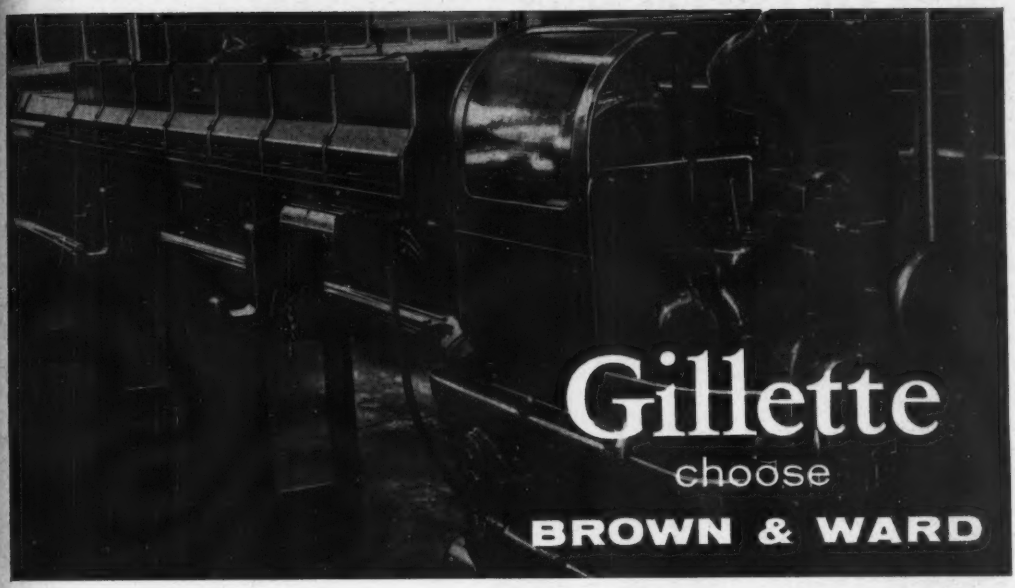
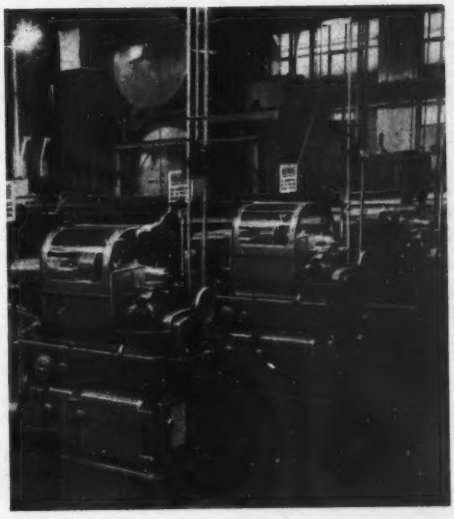
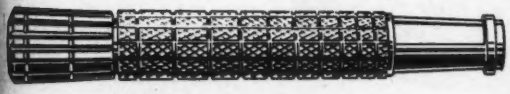


AUTOMATIC BAR FEEDS

To boost the production of component parts for their products to meet an ever-increasing demand, Gillette Razor Company have equipped this battery of Index Automatic Machines with BROWN & WARD AUTOMATIC MAGAZINE BAR FEEDS. Substantial increases have now been obtained, justifying beyond all doubt the confidence that Gillette placed in this equipment which is designed and manufactured to ensure reliability and maximum productive efficiency.
For further information on Automatic Bar Loading the Brown & Ward way, write for details to the address below.





Automatic Bar Machines and Magazine Bar Feeders

BROWN & WARD (TOOLS) LTD.

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OVER 300 ACRES OF PLANT . . .

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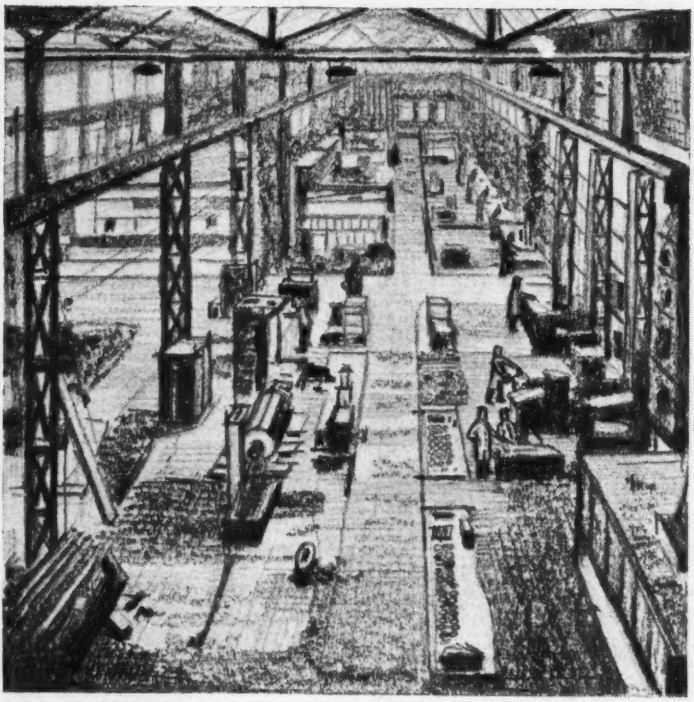

Let's say you have a special job to do, and you doubt if it will pay you to tool up specially for it. Then you call in the Carron technical advisory service. We are used to this sort of problem. Through us you can use Carron's vast plant capacity for components. We have at our disposal 300 acres of plant for casting, forging, machining, enamelling, and sheet metal fabrication. We can give you a quote. Then we do the job for you. Quickly and efficiently.

For medium heavy engineering—

the following capacity is also at your service: planing vertical and horizontal boring mills; milling and drilling work up to 5 tons; moulding and machining capacity for non-ferrous components up to 5 cwts; including high speed routing and precision milling. Fabrications too, light and heavy gauge stainless steel, press tools, welding. For small light gauge sheet metal to large plate welded fabrications. Carron can quote.

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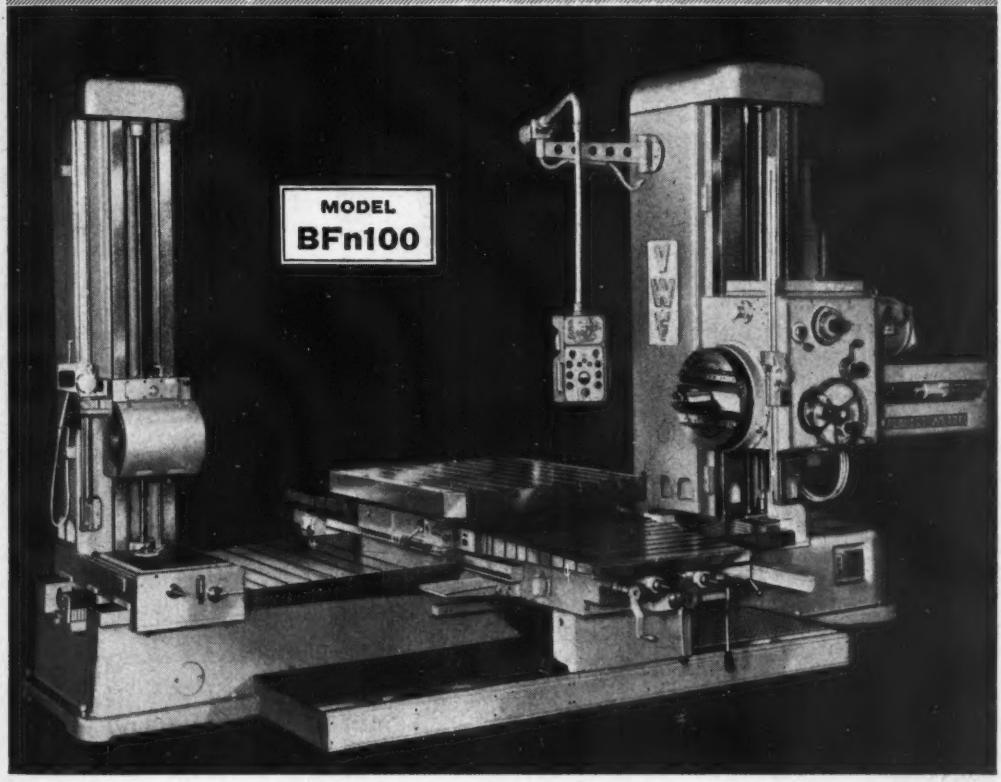
VWF

PLAUERT-WETZEL

Horizontal Boring and Milling Machine



- Boring and milling spindles can be engaged individually or together, at identical or different speeds.
- Pre-selection of a wide range of spindle speeds and feeds, controlled from pendant station.
- Precision scales for co-ordinate settings, Optical fine setting equipment available as an extra.
- Rapid tool clamping in boring spindle by steep angle taper and quick-acting locknut.
- Adjustable, hardened outboard supports for the table slide; included as standard equipment.
- Fully automatic, timed lubrication of slideways, feed mechanism and spindles.

Brief description Model BFn 100

Table dimensions	50 in. x 55 in.
Table load, max.	8 tons
Distance between faceplate and steady	124 in.
Height of work spindle above table	0-55 in.
Cross and longitudinal traverse of table	69 in.
Boring spindle diameter	3.94 in.
Milling spindle diameter	7.09 in.
Boring depth in one traverse/with resetting	35/49 in.
Maximum diameter bored	35 in.
Facing diameter, max.	44 in.
Spindle speeds	9-1400 r.p.m.
Rapid traverse (all directions)	138 in./min.
Main motor	20 HP.
Weight (net, with steady)	17 tons

other models are available

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Machine Tool Co. Ltd

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Staines 55474 (5 lines)
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EASIER STILL TO OPERATE WITH

Push-Button Controls

ALSO CONTROLLED ELECTRICALLY

- Start - Spindle drive motor
- Spindle drive motor Forward-Off-Reverse
- Lamp-brake ON
- Master Stop
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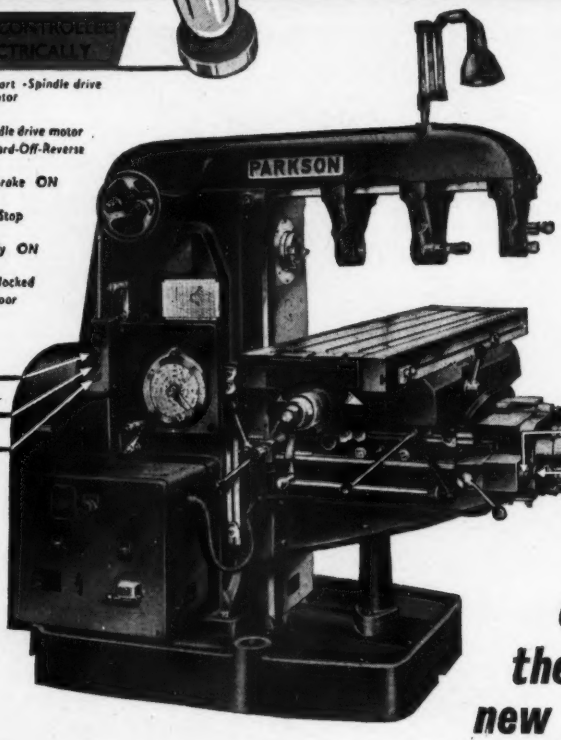
- Isolator-interlocked with hinged door



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3N PARKSON MILLERS

PLAIN MILLER ILLUSTRATED

28 Spindle Speeds in range as selected.	17	to	1000	r p m	
	or 23	to	1330		
	or 25	to	1500		

TABLE

	Size		Movements	
	English (inches)	Metric (mm.)	English (inches)	Metric (mm.)
Plain	70 x 16½	1780 x 420	40 x 12 x 18	1015 x 305 x 455
Universal	60 x 14	1525 x 355	36 x 12 x 18	915 x 305 x 455

J. PARKINSON & SON (SHIPLEY) LIMITED
SHIPLEY · YORKSHIRE · ENGLAND
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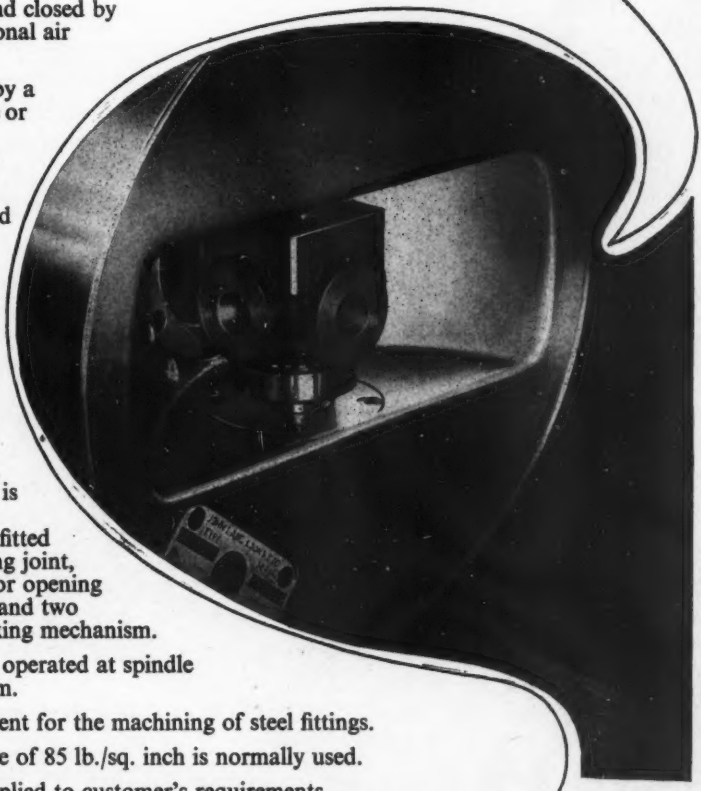
P. 359E

POWER INDEXING

WITHOUT STOPPING THE MACHINE SPINDLE

CHUCKS CAN BE FITTED TO EXISTING MACHINES

LANG POWER CHUCKS



- The chuck is opened and closed by power as in a conventional air chuck.
- Indexing is controlled by a hand valve, a foot valve or a push-button valve operated automatically by the turret slide.
- The workpiece is indexed progressively in 90° steps.
- Indexing time is less than one second.
- Accuracy of index is within ·015″ at a 12″ radius.
- The lock is sufficient for all normal duties.
- The air cylinder which is carried on the back of the machine spindle is fitted with a four-way running joint, two leads being used for opening and closing the chuck and two for operating the indexing mechanism.
- The equipment can be operated at spindle speeds up to 1500 r.p.m.
- Gripping power sufficient for the machining of steel fittings.
- Works air line pressure of 85 lb./sq. inch is normally used.
- Valve gear will be supplied to customer's requirements.

LONDON OFFICE
ASSOCIATED BRITISH MACHINE TOOL MAKERS LIMITED
17 GROSVENOR GARDENS SW1

JOHN LANG & SONS LTD.
JOHNSTONE RENFREWSHIRE SCOTLAND
Telephone: Johnstone 400 Telegrams: "Lang Johnstone"

L 221.M.

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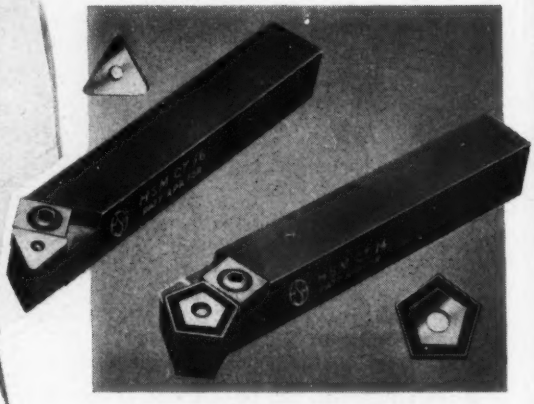
Wejlock tools with Tungsten Carbide "throw-away" tips are the simple, effective answer. The tips have six or ten cutting edges and a worn edge may be changed in less than ten seconds. They entirely eliminate grinding and the need to reset after renewing a tool. If you have a cutting, pressing or excessive wear problem then our advice, based on over 25 years experience, is at your disposal.



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BV 26 - 26¾ in.
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24 speed headstock
4.9 - 400 or 7.5 - 600 r.p.m.
Helical final drive to spindle
48 change feed/screwcutting gearbox

Optional extras include

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CENTRE LATHES FROM 17in. (430 mm) TO 42in. (1065 mm) SWING
SURFACING AND BORING LATHES OF 17in. (430 mm) AND 25in. (635 mm) SWING
LATHES FOR SPECIAL PURPOSES/MATERIALS

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For BORING to close tolerances

ROLLS-ROYCE use

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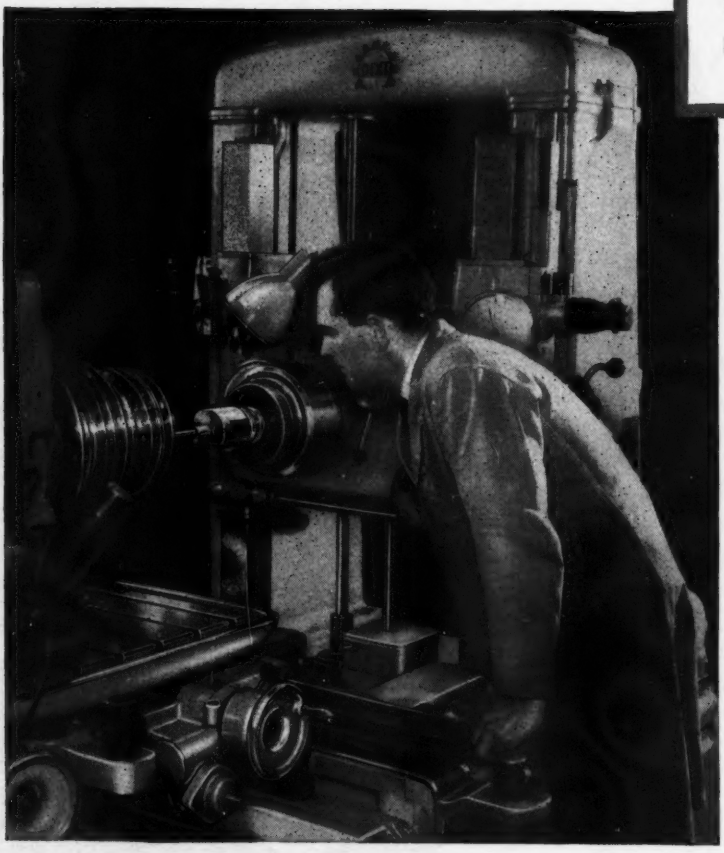
DIXI

HORIZONTAL OPTICAL JIG BORERS



Experimental Compressor Shaft mounted on DIXI circular table, boring fine limit blade pin holes. Maximum tolerance on finish: 16 micro inches.

BRIEF SPECIFICATION	DIXI 60	DIXI 75
Table size	28 3/4" × 32 5/8"	39 3/8" x 32"
Spindle speeds	34 to 1400 r.p.m.	32 to 225 and 225 to 1600 r.p.m.
Spindle dia.	2 3/8"	3"

Write for illustrated brochure M/238 to Sole U.K. Distributors

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To prove to yourself that such savings are realities, we invite you to send any unfinished component you choose to our development laboratory where it will be processed FREE OF CHARGE. Its finished appearance—together with the detailed report provided—will convince you that Almco products are *essential* in keeping pace with modern production methods.

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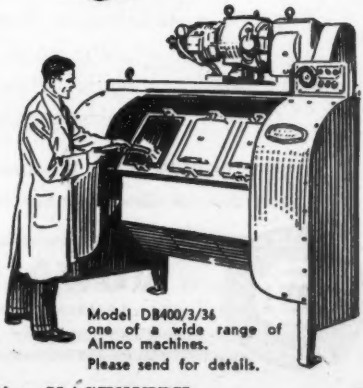

Model DB400/3/36 one of a wide range of Almco machines.

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For Long Splines

Taper or Parallel Serrations *plus* High Angle Spiral Gears

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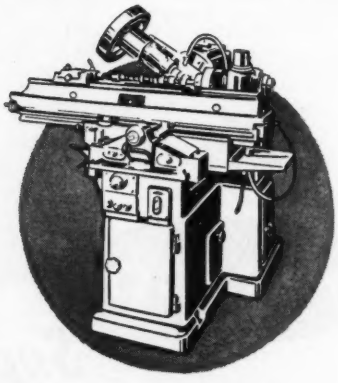
H.7 HORIZONTAL UNIVERSAL HOBBER



Powerful and rigid. Suitable for climb or orthodox hobbing. Built-in differential for helicals. Heavy duty or high spiral angle hob heads. Taper hobbing attachment available which also permits combined plunge and axial feeds to be used for hobbing gears in between shoulders.

7" DIAMETER, 8 DP., 18" HOBBING LENGTH, 24" BETWEEN CENTRES, SPINDLE BORED 3" DIA.

See this Machine at our Showrooms.

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For *Rapid* . . . . Precision Gear Grinding

SWISS **REISHAUER**

GEAR GRINDER MODEL NZA

Operating on the continuous worm generating principle, REISHAUER Gear Grinders are exceedingly rapid and precise. There are no facets and no burning of the teeth. Set-up is simple and can be performed quickly. Single gears can be ground as economically as batches. Changeover from roughing to finishing is automatic – grinding to finished size also. Tip and root modifications can be easily incorporated. Crowning can be performed – *and* two-way grinding. Both spur gears and spirals up to 45° can be ground – fine pitch gears from the solid. A wheel truing device is incorporated.

Work diameter ⅛" to 11¾". Pitches 48 to 5DP.

Also the REISHAUER DS for lapping diamond wheel-truing tools.
Other models made by REISHAUER:
OZA, without truing device and ZB for gears up to 27½" dia. 3½ DP.

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for perfection in diamond wheels

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SLIDIN
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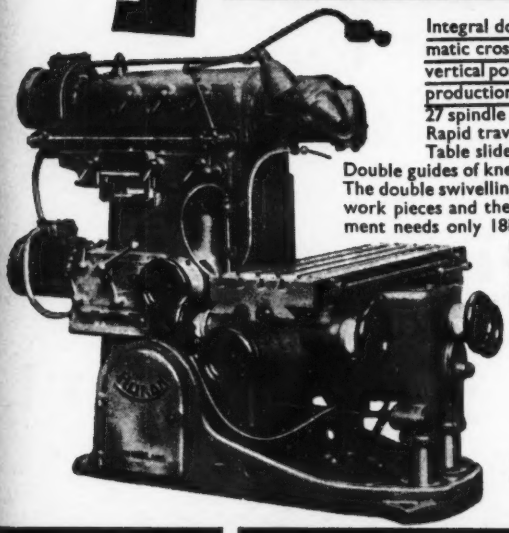
SLIDING RAM GIVES 27½in. AUTO CROSS FEED

HEAVY DUTY MILLING

ANGULAR COMPOUND HORIZONTAL VERTICAL

HURON SUPER UNIVERSAL MILLERS



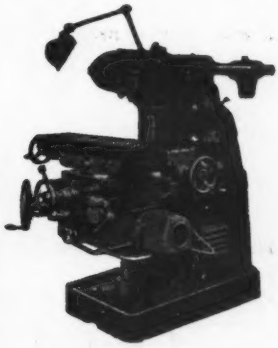
Integral double swivelling universal head provided with 27½in. automatic cross feed by the sliding ram, can be set to the horizontal or vertical position, or to any angle instantaneously—permits the heaviest production cuts. Head can be retracted completely from table line. 27 spindle speeds from 30 to 2,066 r.p.m., 27 feeds from $\frac{1}{16}$in. to 30in. Rapid traverses in all directions. All operating controls duplicated. Table slides directly in the knee without cross movement or swivel. Double guides of knee permit components in excess of 1½ tons to be machined. The double swivelling universal head requires an opening of only 14in. to enter work pieces and the whole sliding ram with its 27½in. automatic cross movement needs only 18in. clearance. OPTIONAL EXTRA FEATURES: Mounted spacing casting assemblies providing additional 8in. capacity under spindle. 26in. wide 8 T-slot tables and 39½in. automatic cross feed of sliding ram with special heavy duty knee and front operating position.

Type	Table	Automatic Feeds Long	Cross	Vert.
KU4	56½in. × 15½in.	43½in.	27½in.	19½in.
KU5	64½in. × 15½in.	51½in.	27½in.	19½in.
KU6	78½in. × 16½in.	59in.	27½in.	19½in.
KU55	64½in. × 26in.	51½in.	38½in.	18½in.
L83	157in. × 59in.	118in.	39½in.	59in.

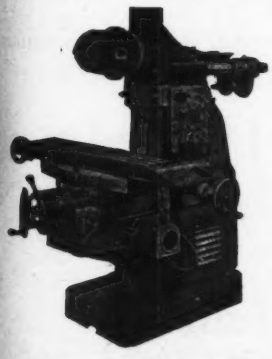
Type 'L' Open-side Traversing Head Universal Miller will mill, bore, slot and drill the largest work-pieces at one setting. The unique design permits greatest variety of operation on large work-pieces; the component remains stationary on the large work-table. Upright slides full length of base table and the sliding ram moves vertically and horizontally.

DUFOUR UNIVERSAL MILLERS

WITH DOUBLE UNIVERSAL SWIVELLING HEAD, RETRACTABLE SLIDE BRACKET AND SPACING CASTING GIVING 26" DAYLIGHT ON No. 59 AND 21" ON No. 61



FOR ALL MODELS Direct reading dial change for speeds and feeds. All parts subject to wear hardened and ground and completely interchangeable. Built to closest tolerances. Rapid traverses in all directions. Table swivels 30°. No. 40 taper for main horizontal spindle, double swivelling universal head, dividing head and rotary table. Hardened and ground centre guide for slideways. Twin overarms. Double swivelling sliding spindle heads with speeds 53-3000 r.p.m. Double swivelling universal head on retractable slide bracket providing with 5½in. Spacing Casting Drive assembly on 59 Machine 26in. daylight, and 21in. on No. 61.



MODELS 53 & 61. 16 universal head spindle speeds 21-1600 r.p.m.; 8 horizontal spindle speeds 21-1180 r.p.m.; 8 automatic feeds ½-18½in.

MODEL 59. 36 universal head spindle speeds 14-1780 r.p.m.; 12 horizontal spindle speeds 21-1180 r.p.m.; 16 automatic feeds ½-20in.

MODEL 54. Automatic cross feed of universal head 20in.; 18 universal head spindle speeds 12-1500 r.p.m.; 36 horizontal spindle speeds 6-1500 r.p.m.; 18 automatic feeds $\frac{1}{16}$-23½in.

Type	Table	Automatic Feeds Long.	Cross	Vert.
53	43½in. × 9½in.	27½in.	9½in.	15½in.
61	47½in. × 10½in.	30½in.	9½in.	15½in.
59	51½in. × 11½in.	34½in.	11½in.	21½in.
54	67in. × 14½in.	43½in.	14½in.	20½in.

Send for full particulars of our very extensive range of these machines; ask for demonstration.

Rudolph Carne & Co. Ltd. SWAN WORKS, FISHERS LANE, CHISWICK, LONDON, W.4.

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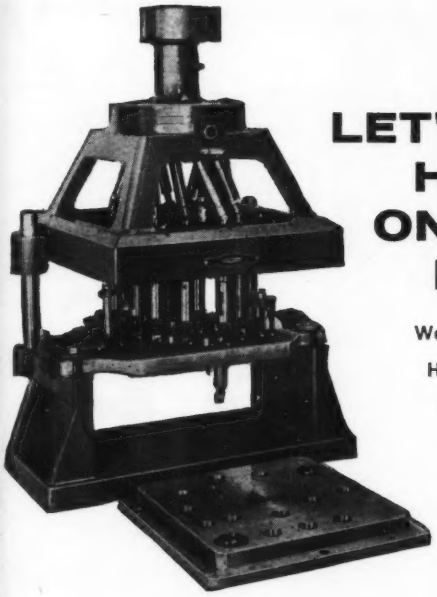
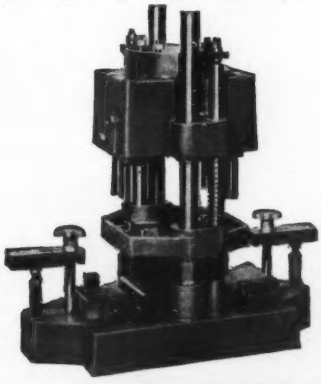
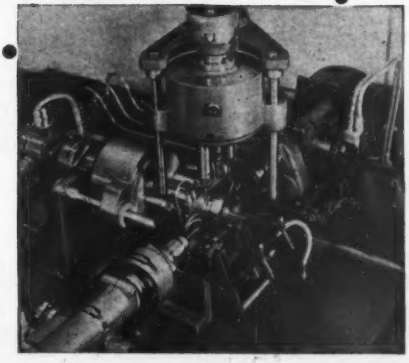


LET'S PUT OUR HEADS TOGETHER ON YOUR DRILLING PROBLEM

We supply precision built multi-spindle drilling and tapping Heads to suit your machine—for light, medium or heavy work and with spindles up to No. 5 M.T. Geared, gearless and adjustable types are available to meet your requirements. Additionally, we can supply complete tooling, fixtures, bushplates etc. for your particular application. We design and build special-purpose machines incorporating multi-spindle Heads to meet your own specific needs.





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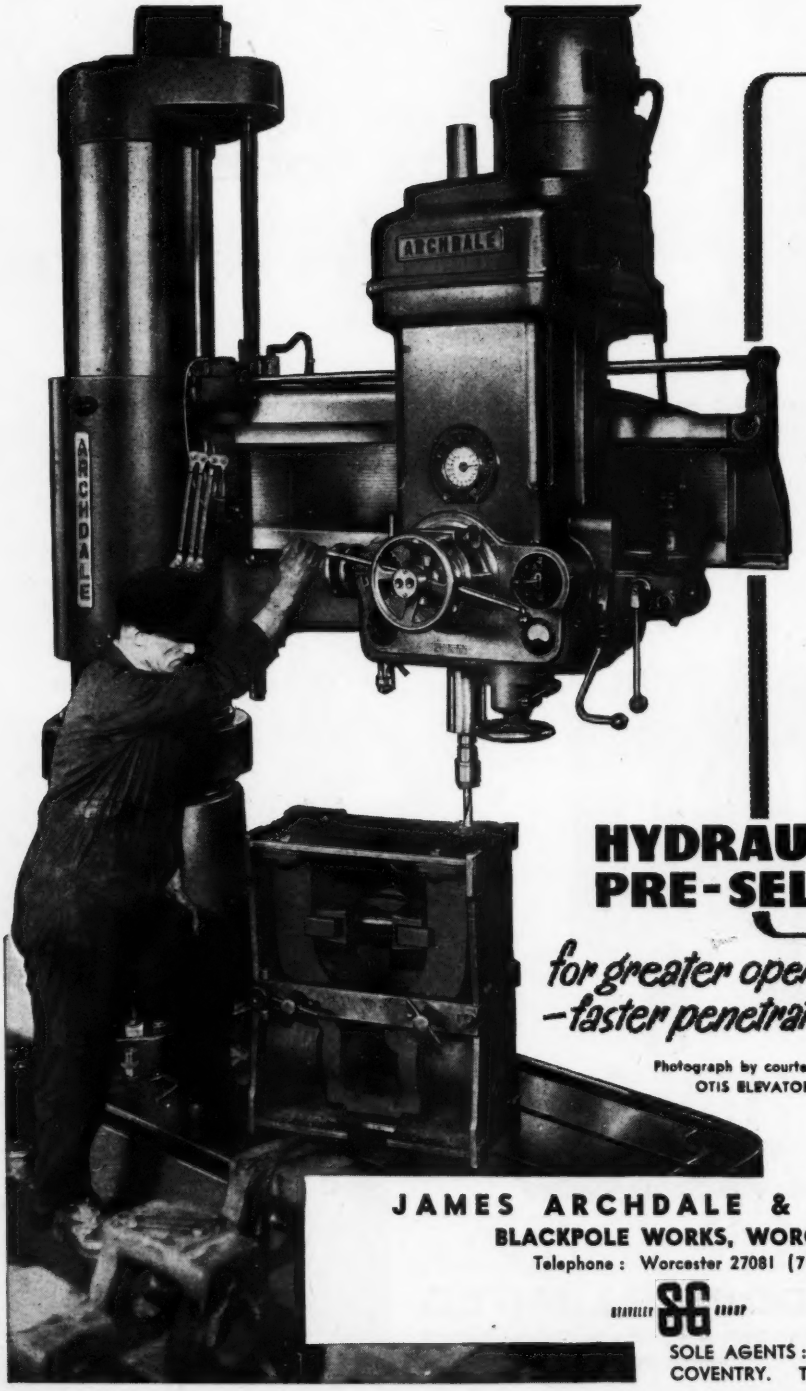

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for greater operating speed —faster penetrating capacity

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10 Reasons
why you will now choose a THOMPSON
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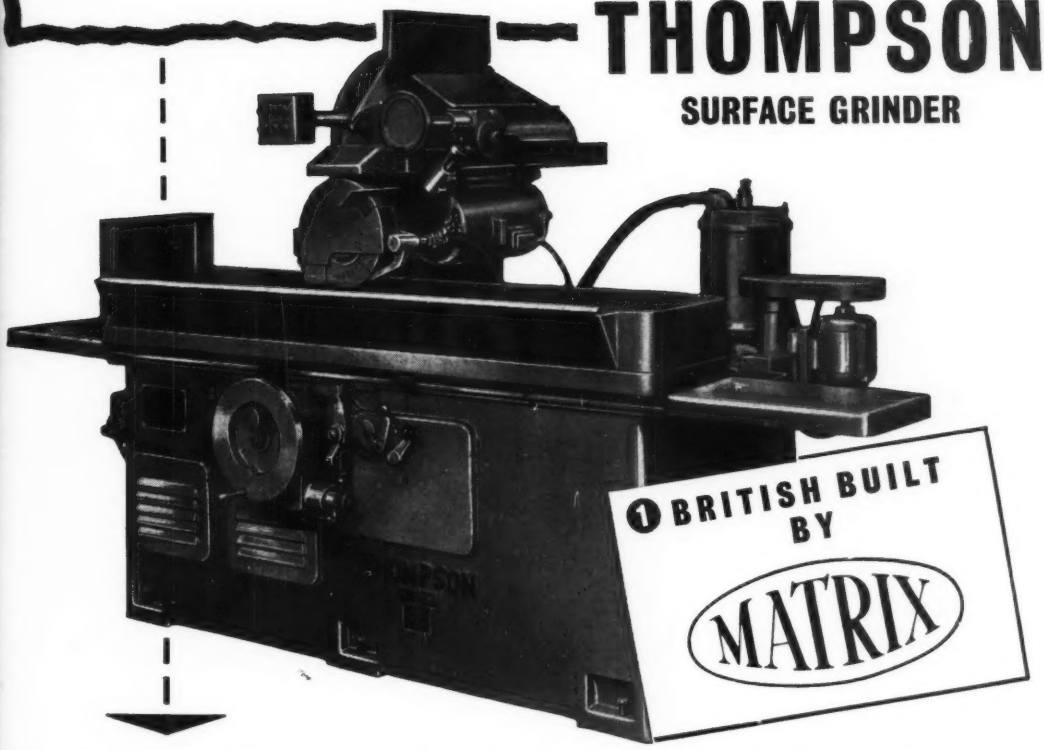

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Work table runs on Vee and Flat Slide. Extra heavy column, wheelhead on large rectangular ways.

4 **FLAME HARDENED CROSS SLIDE WAYS**
Heavy dove-tail ways are hardened and ground.

5 **AUTOMATIC LUBRICATION**
Filtered oil supply prolongs life of ways.

6 **GRINDING WHEEL SPINDLE MOUNTED IN PRECISION BALL BEARINGS**
ADJUSTABLE BRONZE FRONT SPINDLE BEARING SUPPLIED IF PREFERRED.

7 **MANUAL CROSS FEED**
Standard equipment for accurate shoulder or slot grinding.

8 **REDUCED OPERATOR FATIGUE**
Simplified controls conveniently grouped in operating area for easy operation.

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Hydraulic rapid traverse of wheelhead provided for speedy loading or starting cut.

10 **CROSS FEED WHEELHEAD**
Built-in wheel dresser and hydraulic truing feed to wheel head.

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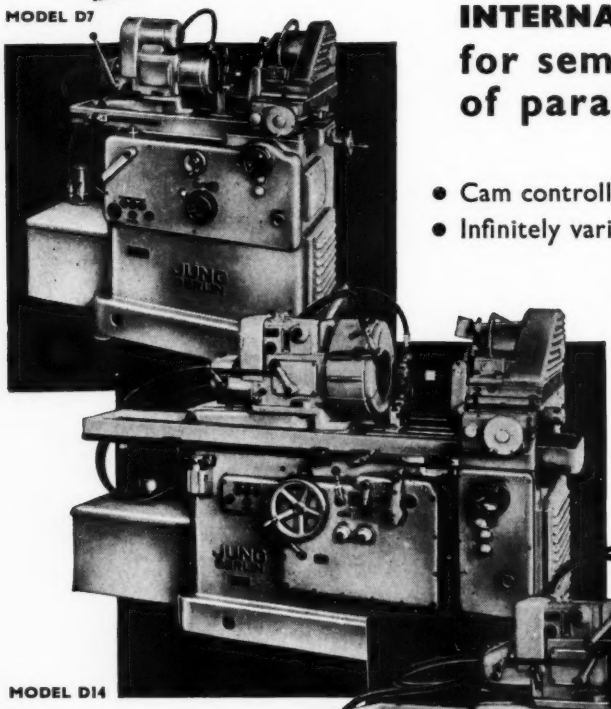
NEW 'D' TYPE

JUNG

MODEL D7



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Features include:-

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- Infinitely variable table speed control
- Sizing to preset diamond
- Work head swivel 30°
- Centralised Controls for quick setting up

Radius and profile dressers and face grinding attachments available for all models.

Fully Automatic Models also available.

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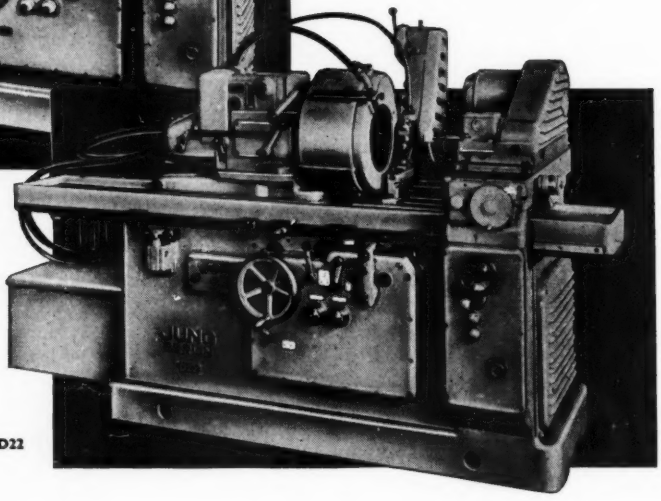

MODEL D22

CAPACITIES

Model	Max. Bore Diameter	Max. Bore Length
D7	1⅝"	2¾"
D14	4"	6"
D22	6"	10"

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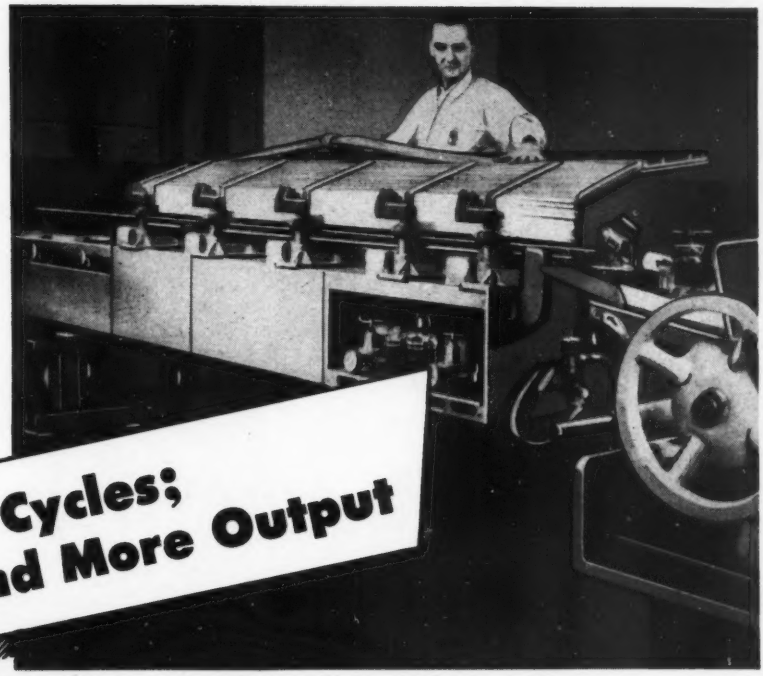

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with Less Fatigue and Higher Sustained Production

Machine speed — not worker efficiency — governs production on automatics equipped with Lipe Automatic Machine Loading Bar Feed. That's because Lipe takes over the tedious, back-breaking hand-loading — leaves the machinist free to concentrate on quality . . . machine set-ups . . . care of tools.

The LIPE AML Bar Feed

automatically and continuously feeds stock of practically any length, shape or material in close-tolerance feedouts. Users report production increases of 40 per cent. . . . 90 per cent. . . . even 200 per cent. per machine, plus labour benefits that are even more important.

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In South Africa, compressed air is used for a wide range of duties in the Gold Mines. At the Loraine Mines in the Orange Free State, "BROOMWADE" Type EH255 Air Compressors, running at 310 r.p.m., are installed 5,200 feet below the surface to boost 3,500 cu. ft. of air from a pressure of 75/80lb. per sq. in. to a final working pressure of 105lb. per sq. in.

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For such duties absolutely RELIABLE plant is necessary.

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MODEL AV2
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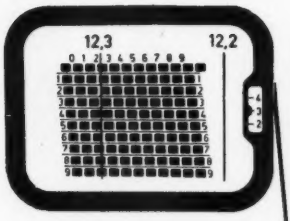
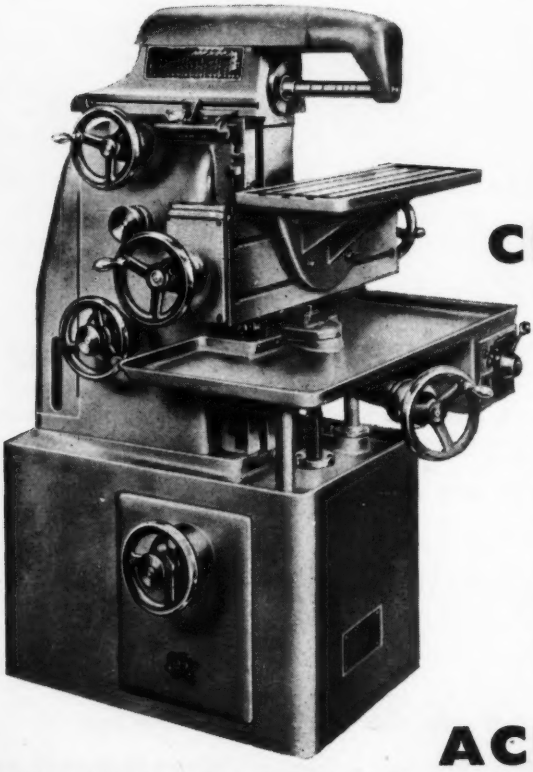
Table size 19½in. x 11in.
Longitudinal movement 16in.
Transverse movement 11in.
Max. distance spindle to table 18½in.
Infinitely variable spindle speeds from 60-3200 r.p.m. with power feed to spindle.



Two scales as shown controlling longitudinal and transverse settings



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with Table swivelling in 3 planes

FOR HORIZONTAL & VERTICAL MILLING

Especially suitable for toolmaking and for high precision repetition work.

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The complete Harvey service covers advice, design and installation, and List No. 996 shows many types already supplied.

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Shaping Machines—From 12" to 35" stroke.
Gardone Slotting Machine—Ram stroke $7\frac{7}{8}$".
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Mechanical & Hydraulic Surface Grinders.
Capacity $27\frac{1}{2}$" x $7\frac{1}{8}$".
Horn Tool & Cutter Grinder. Max. dia. 9".

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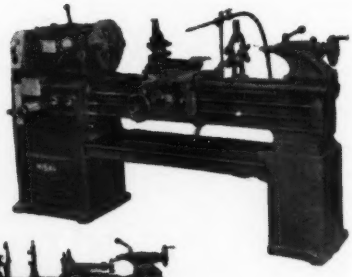

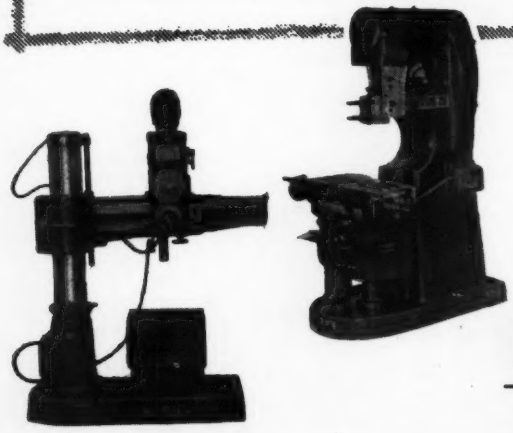

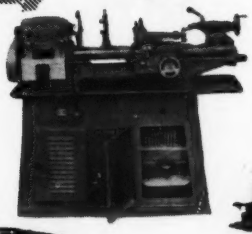

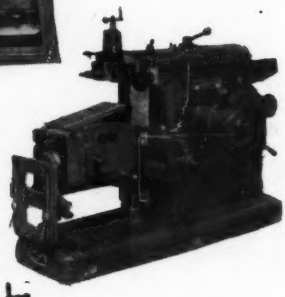

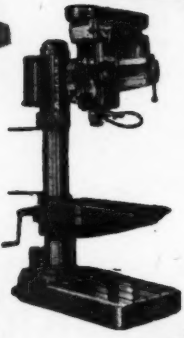

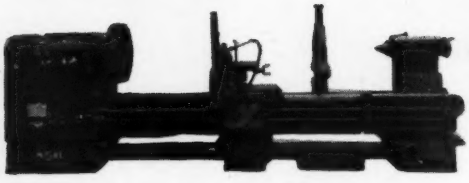

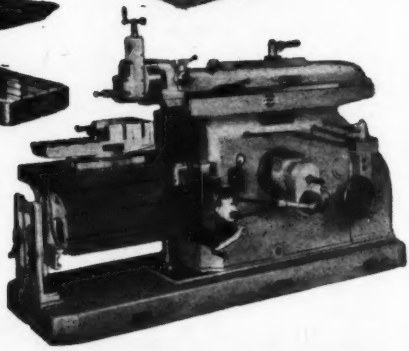

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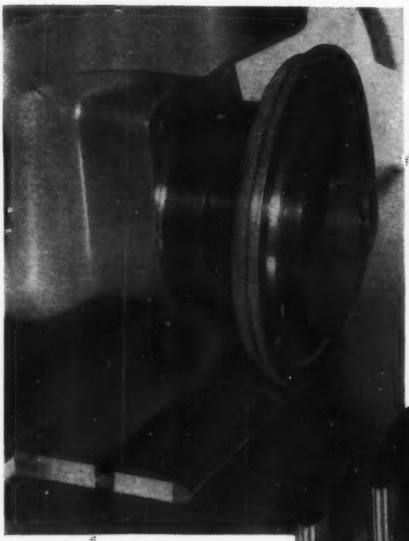

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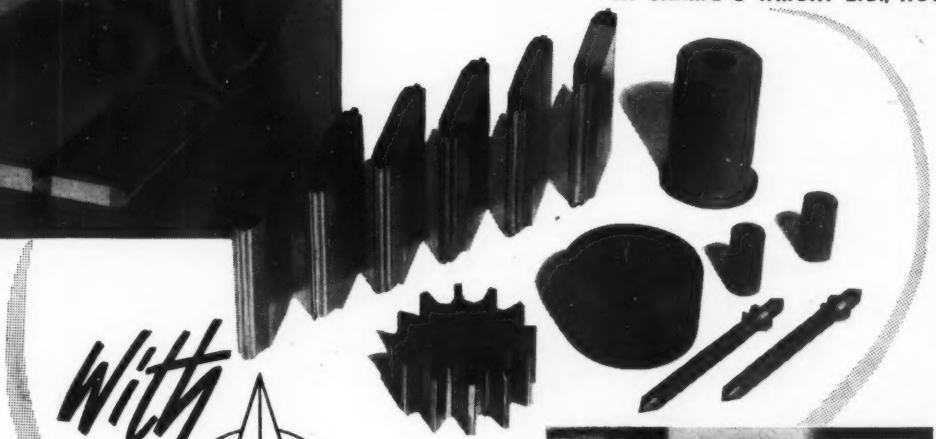

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★ ENABLES THE MOST DIFFICULT FORMS IN TUNGSTEN CARBIDE TO BE PRODUCED WITH EASE AND ACCURACY
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★ WHEELS RETAIN THEIR ORIGINAL SHAPE THROUGHOUT THE WHOLE OF THEIR LIFE

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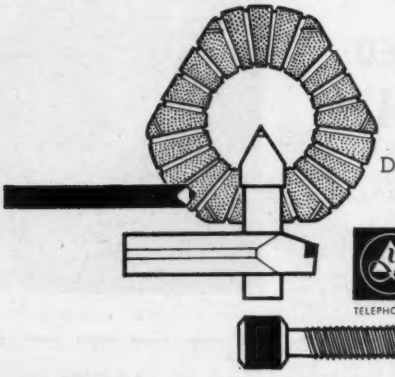

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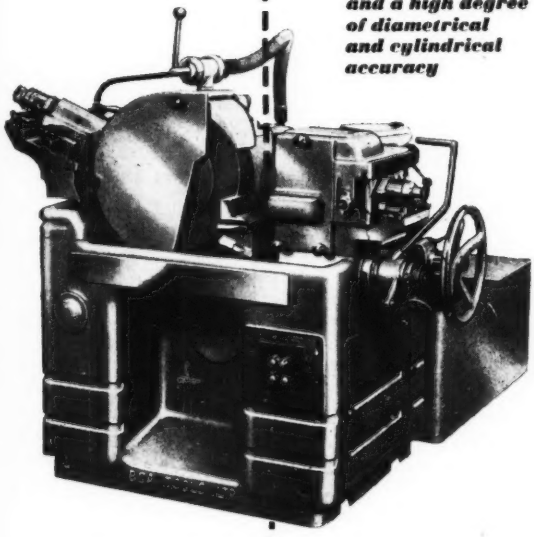
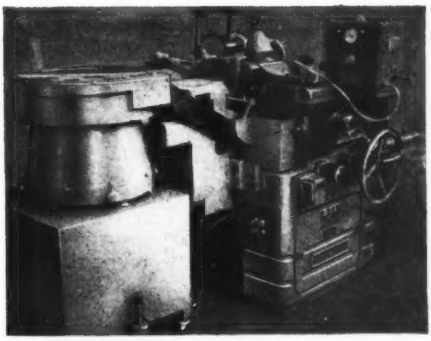


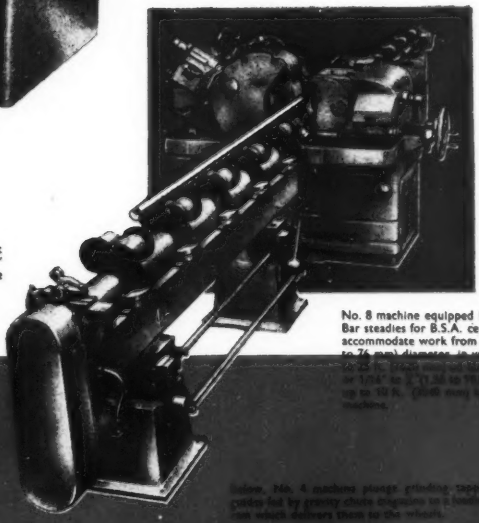


No. 4 machine equipped for automatic sizing-control and automatic infeed. Vibratory type hopper Special bolts 7/16" x 2 7/8" (11 mm x 73 mm) long are ground to a tolerance of 0.0005" (0.012 mm) Production : 700 bolts per hour. Sizing-control incorporates automatic grinding wheel head feed-compensation.

No. 4 MACHINE

Work diameter :	1/16" to 3" (1.58 to 76 mm)
Grinding wheel Speed :	1270 rpm
Control wheel Speeds :	4
Width of wheels :	4" (101 mm) or 5" (127 mm)
Main motor :	10 h.p.

*(With special equipment work down to 0.010" (0.254 mm) dia. can be accommodated).



No. 8 machine equipped for bar grinding. Bar steadies for B.S.A. centreless grinders accommodate work from 1/16" to 3" (1.58 to 76 mm) diameter in various lengths up to 25 in. (635 mm) or less than [illegible] machine, or 1/16" to 3" (1.58 to 19.05 mm) diameter up to 10 ft. (3048 mm) long on the No. 4 machine.

No. 8 MACHINE
Work diameter 3" to 6½" (3.17 to 167 mm)
Grinding Wheel Speed : 1150 rpm
Control Wheel Speeds : 12
Width of Wheels : 5" (127 mm) or 6" (203 mm)
Main Motor : 20 or 40 h.p.

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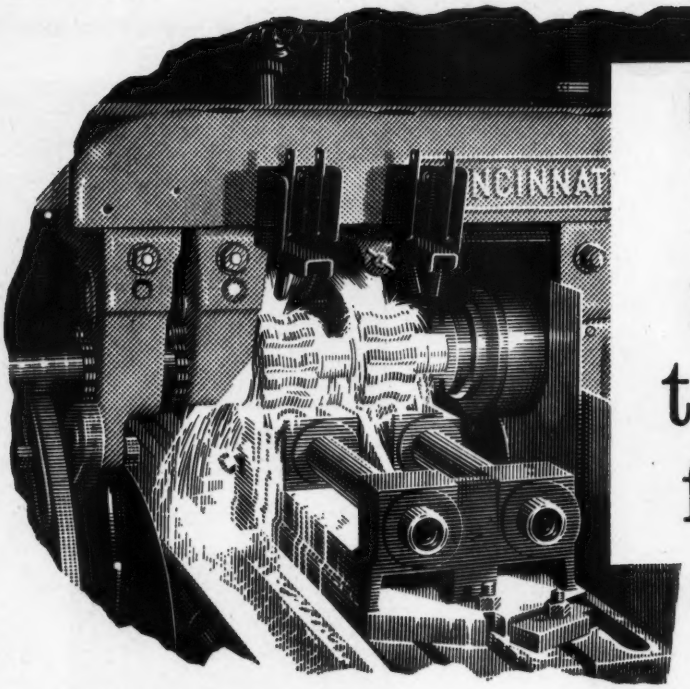

It's a fight to that finish

These are highly competitive days, when all production effort is geared to one objective—to make an article just that bit quicker, better or cheaper than the next fellow. This worthy motivation leads to profits—production and financial. Something about mousetraps comes to mind but we'll spare you the repetition. Aren't we all machinists anyway? Sometimes, of course, the finish is a fight in itself. Newer materials, unfamiliarity with techniques used elsewhere, switching over to new contracts, turnover of labour —all these factors pose fresh problems to those men in your organisation who are paid to have production headaches—and solve them. Speaking for ourselves, co-operation is far from being a hollow sentiment at the foot of a letter. Maybe we can help. If you are waging a private joust with poor finish (and losing), leading a personal crusade to improve tool life or just grumbling for the hell of it, maybe we could come in on your particular problem. If cutting fluids can assist in any way, we have a nice string of thoroughbred products, all raring to go and machine trained to boot. After 45 years, we should know our onions — and our production oils. Interested? Then call in the experts.

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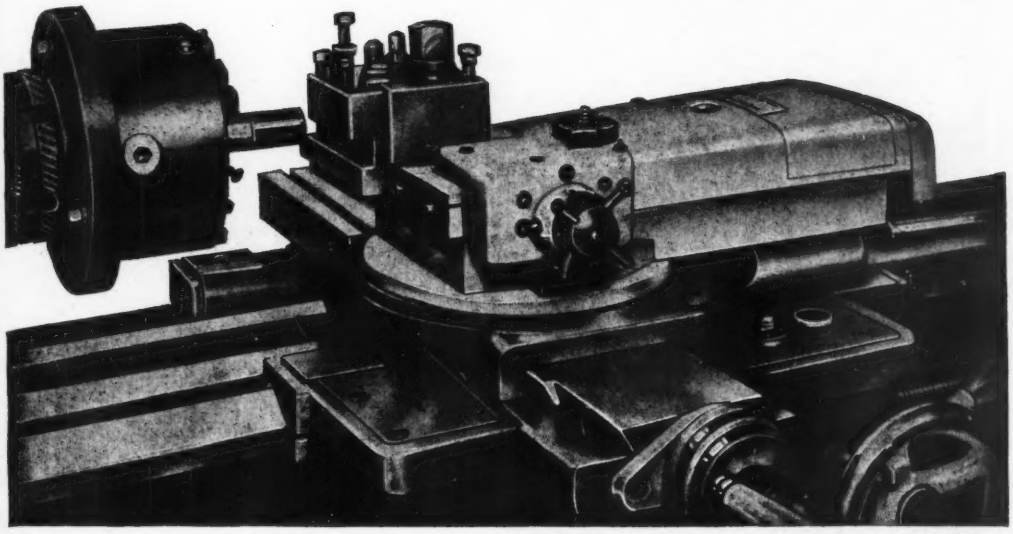

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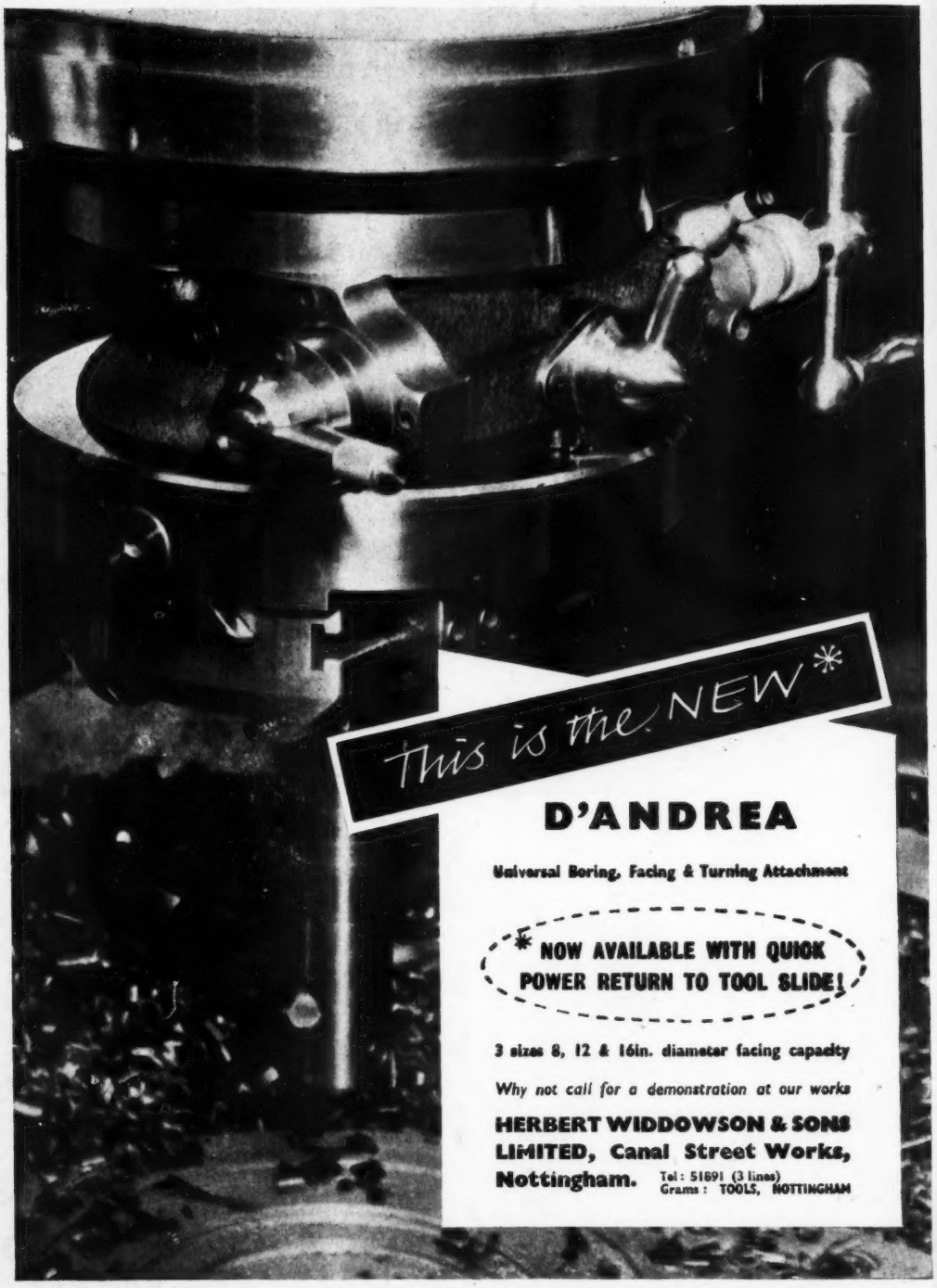
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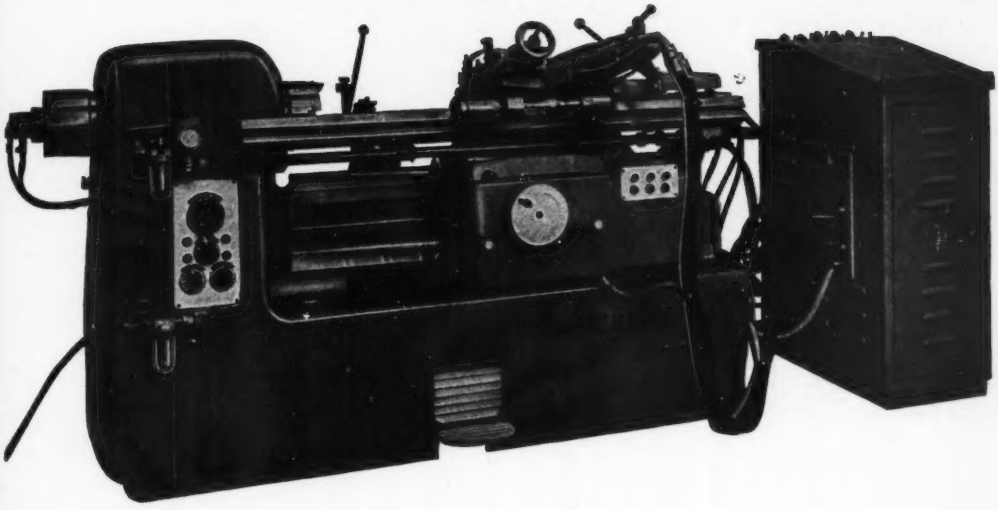

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Basic price under £2,000.

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Bore of spindle	2¼in.
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Max. length turned	27¼in.
Hydraulic traverse of copying slide	4in.
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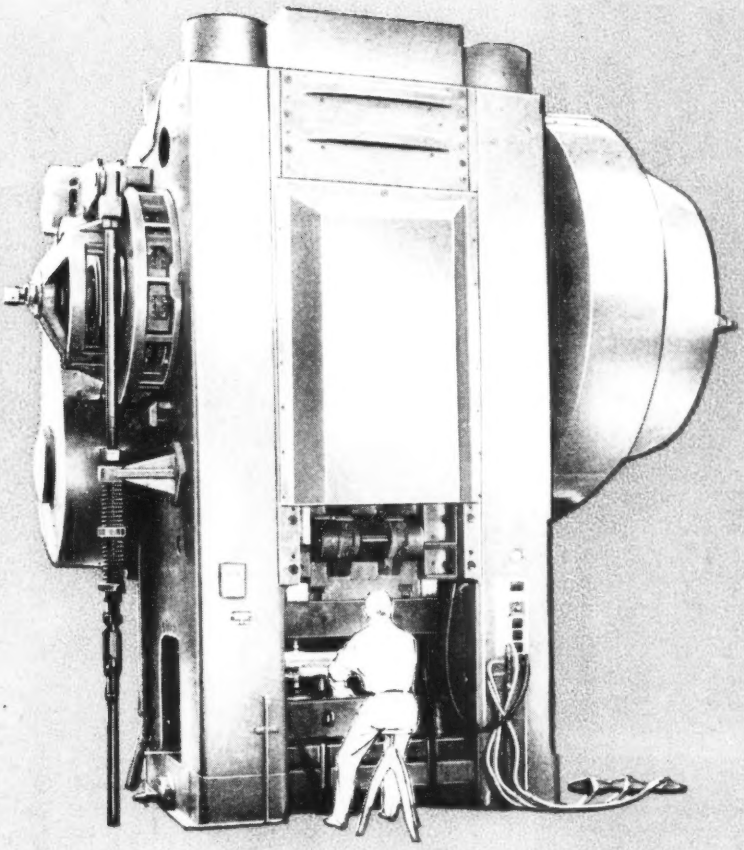

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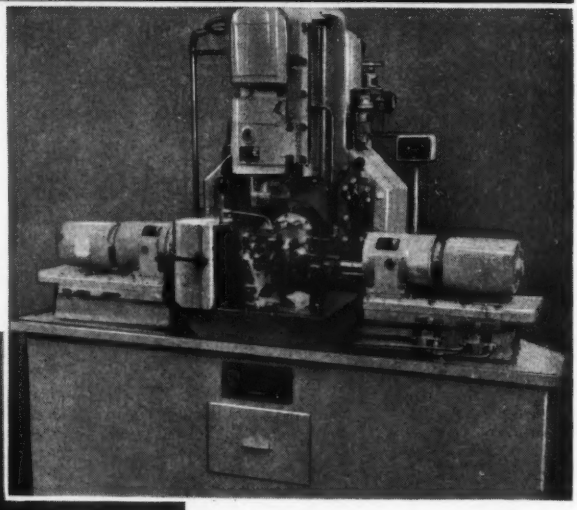

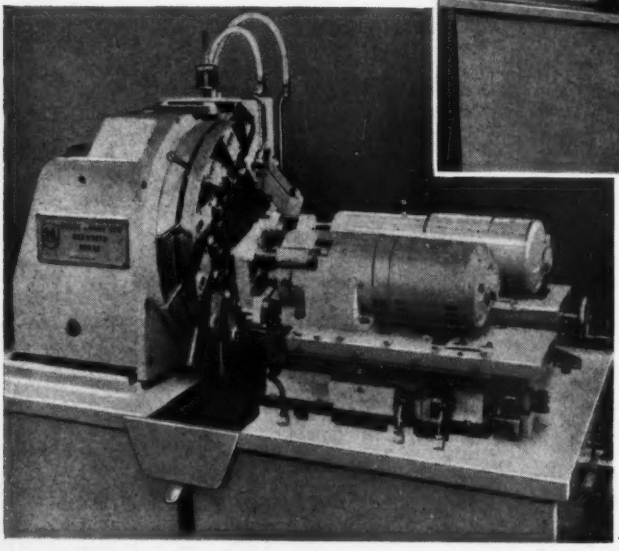

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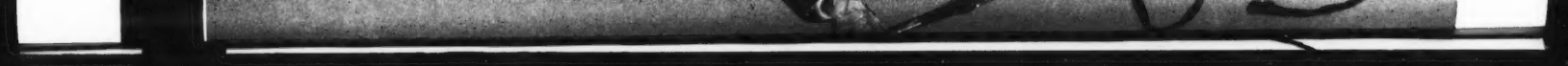
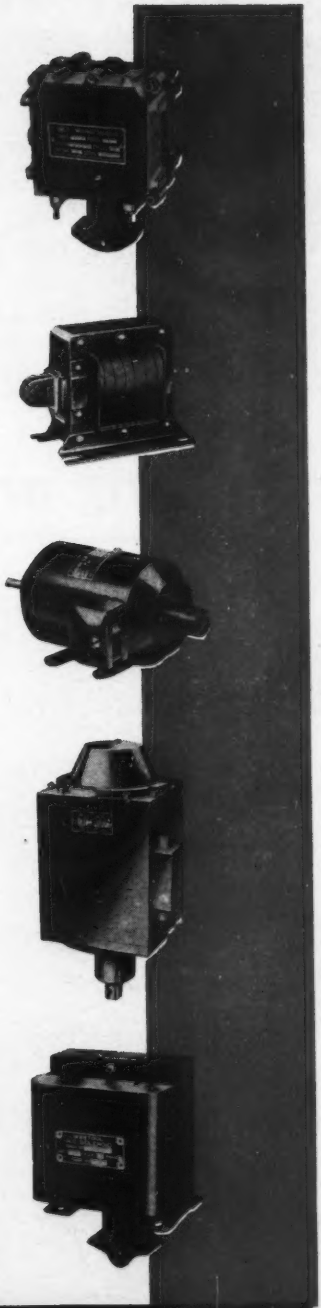


July

hopping for Solenoids



"Cynthia, darling, be reasonable; nobody told me Westool had such a whopping big range of solenoids, they simply said get Westool . . . they're so compact, utterly, utterly reliable. Seems they're tested and re-tested at every stage of manufacture. What a frightful bore! Still, I expect it's one reason why Westool solenoids are so jolly good. Steady, old girl! We shan't be long now, we've got the D.C. Pull and Thrust models, we've only to collect their A.C. Types. Cynthia—really!"

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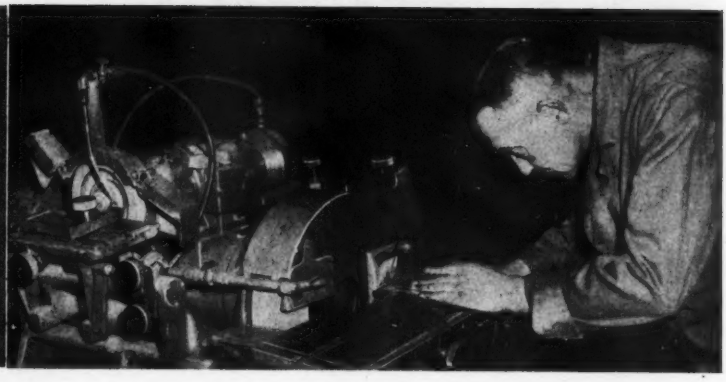
WESTOOL LIMITED

AJF



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grinding and lapping machine

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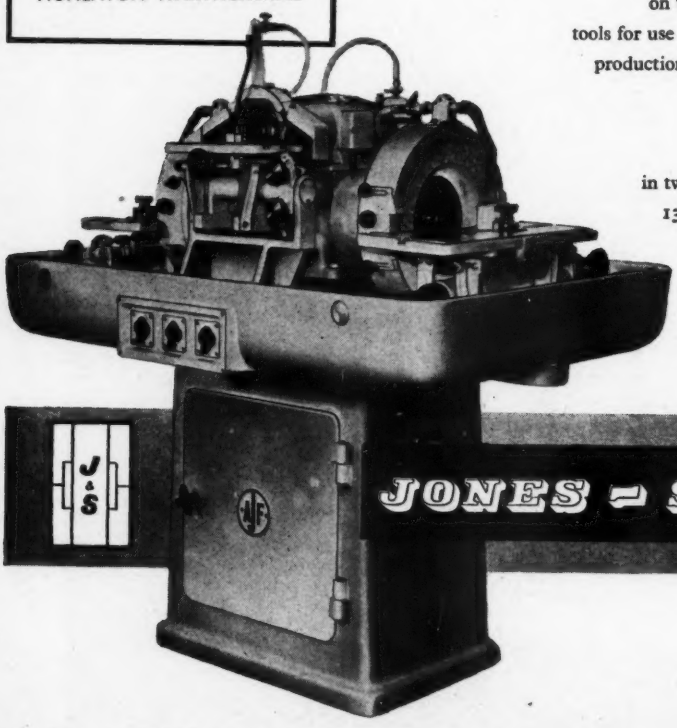
The AJF machine has many commendable features for grinding Carbide Tools, all of which are readily appreciated by Clarkson (Engineers) Ltd., who regrind on this machine all carbide tipped tools for use on their copying lathes for the production of their well-known products of Milling Arbors, End Mills, Cutter Grinders, etc. The machines are available in two sizes with 8in. diameter and 13¼in. diameter grinding wheels.



ABOVE ILLUSTRATION
Roughing the radius on a carbide tipped turning tool.

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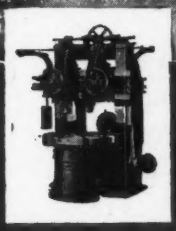

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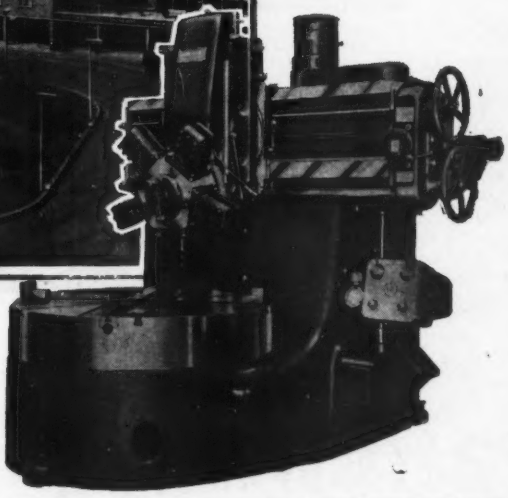
Over seventy years ago Webster and Bennett began building machine tools and a reputation for quality and value. They have never been surpassed.

Broadgate today, and the latest W & B design.



Today, Webster and Bennett boring and turning mills incorporating the most advanced engineering technology continue to enrich their reputation and the future of the people who use them.

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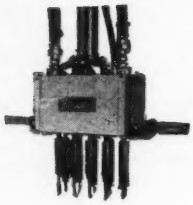
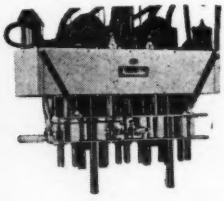


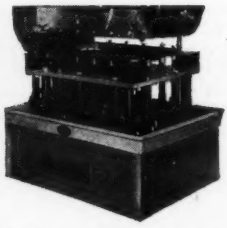
A Desoutter multi-studrunner plants 9 studs into an Austin cylinder block.

CHOUF!



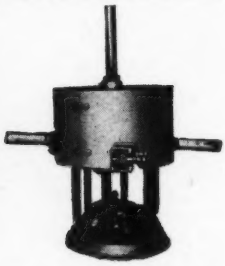
A Desoutter multi-nutrunner fixes 25 nuts on a Ford diesel cylinder head.

CHOUF!



A Triumph Herald sump is put on by a Desoutter 16-spindle multi-nutrunner.

CHOUF!



A Desoutter multi-nutrunner assembles a Vauxhall clutch plate, or tightens the wheel nuts on a Rootes Group car. And so it goes on: the Desoutter CHOUF speeds mass-production, makes sweet music in industrialists' ears. And no wonder—everyone has a taste for that sort of music—and nearly everyone has something to play it on! CHOUF! (on a carburettor)...CHOUF! (or a light fitting)... CHOUF! (or a washing machine)... CHOUF! (or anything else that needs assembling).

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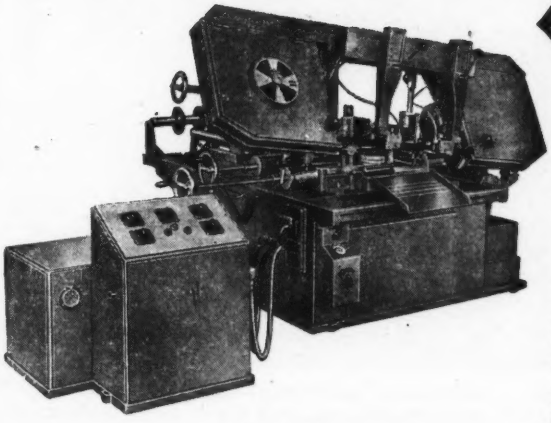

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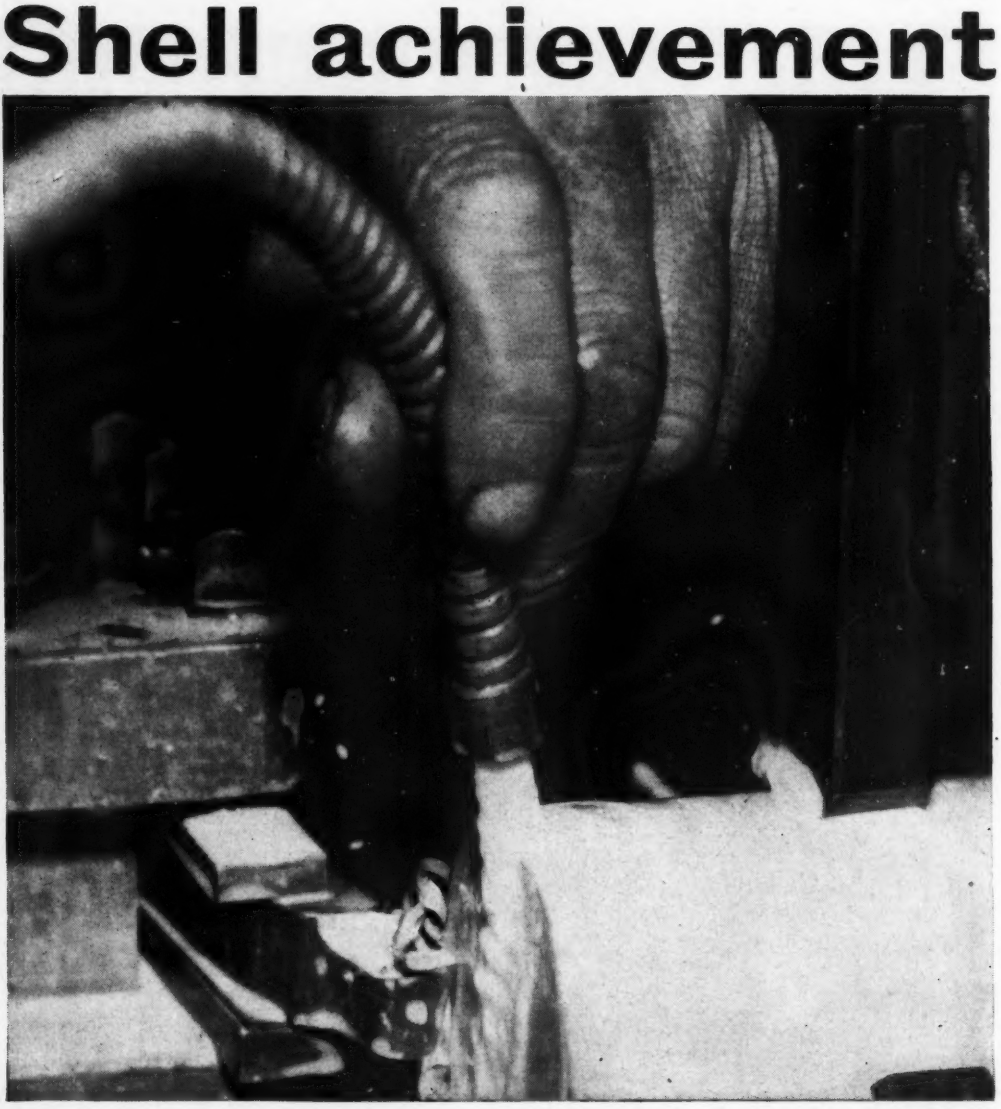

One of Shell's recent achievements in Industrial Lubrication has been to reduce the risk of skin trouble for machine operators. Until the new Shell Dromus range, most modern soluble cutting oils contained phenolic compounds, which can cause skin irritation. They were used as coupling agents between the actual oil and the emulsifier. On high-speed machines, especially, the water evaporates and the emulsion concentrates. And that's when the trouble can start. Shell scientists found a better coupling agent, and made it work. And now, at no extra cost, management can reduce working risks for their staff. *Write for the book, 'Selecting Your Cutting Oils', to Shell-Mex House, London.*

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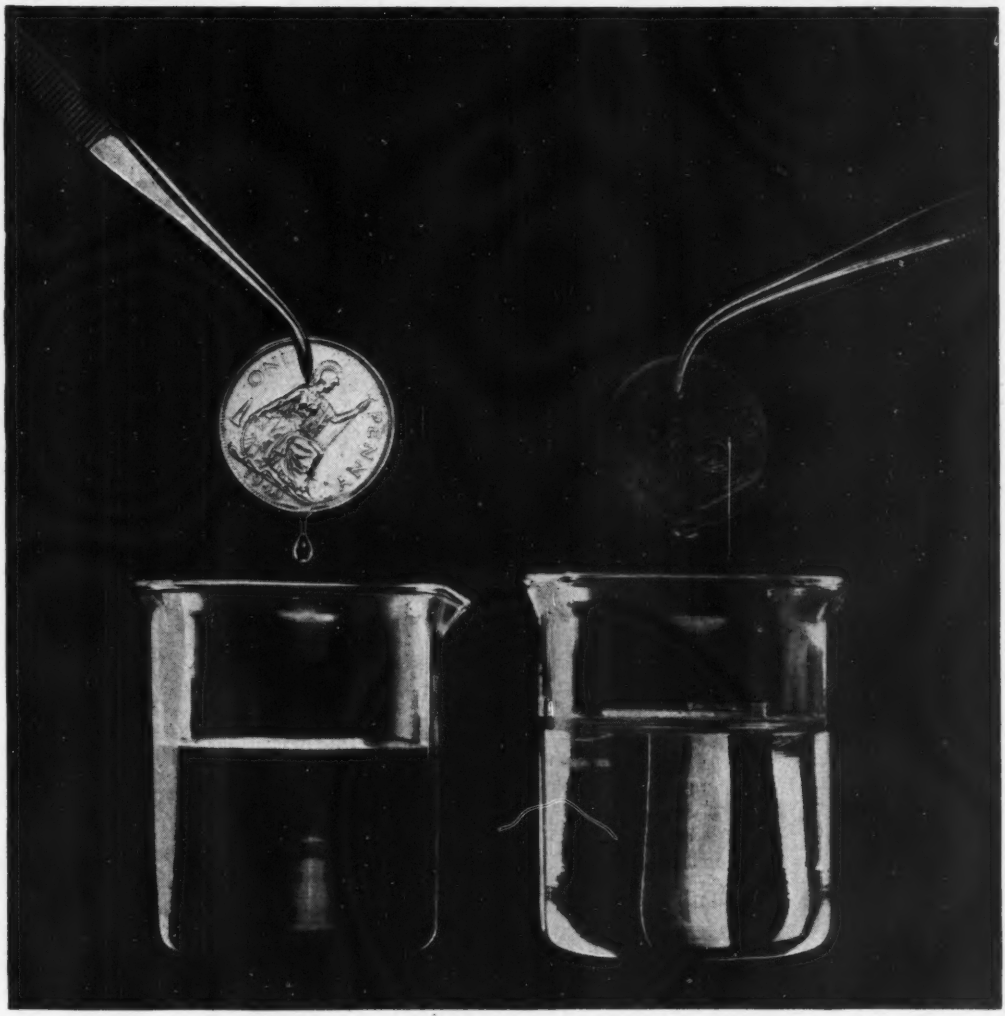
Shell demonstration



Two clean, bright pennies are placed in beakers of oil, of equal performance level, one Shell Garia Oil 21, the other a conventional cutting oil containing sulphurised additives. After three hours at room temperature one penny is still bright and stain-free, the other heavily stained with black copper sulphide. The bright penny is from the beaker containing Shell Garia Oil 21, the blackened one from that containing the conventional oil. While these were just pennies they could have been bronze bushes in your machine tools—stained in less than half a shift. Sulphur is essential in heavy-duty cutting oils. Special additives in Shell Cutting Oils protect your machine tools and yet allow the sulphur to do its job.

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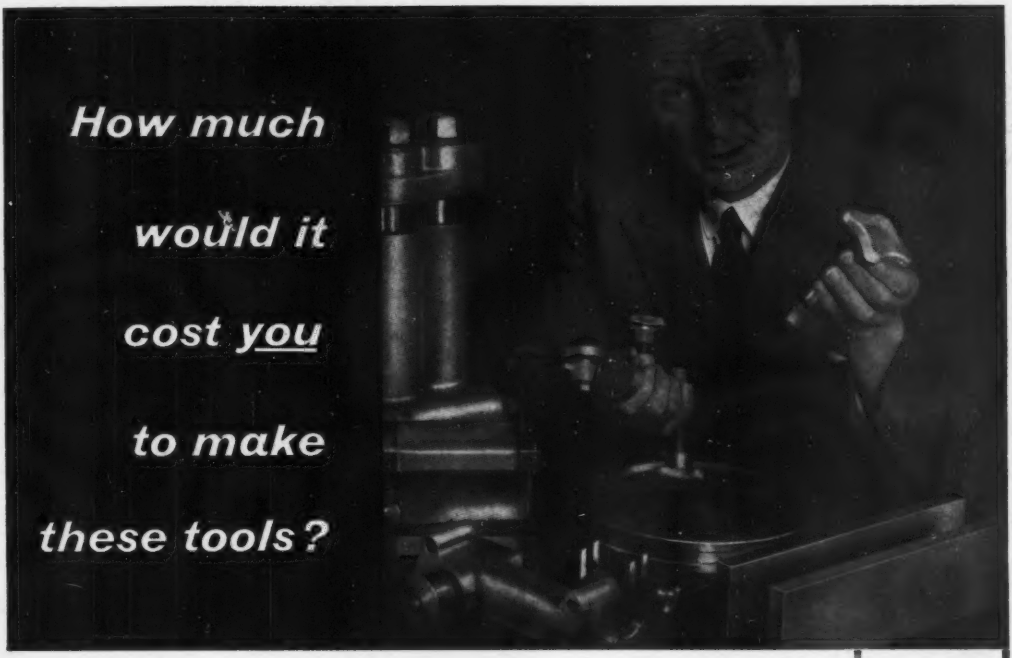

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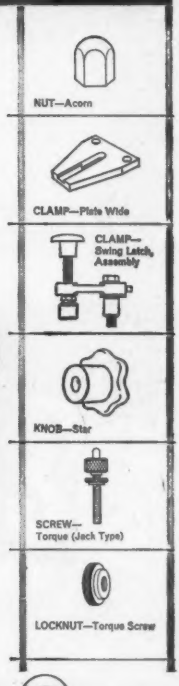

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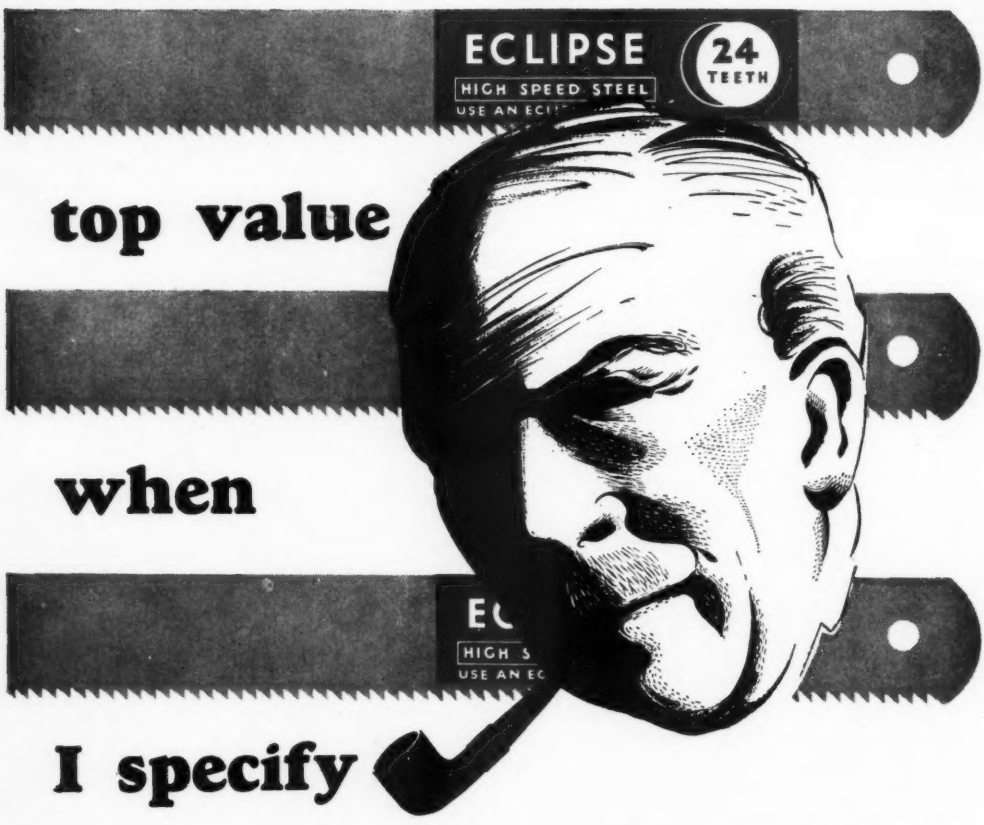

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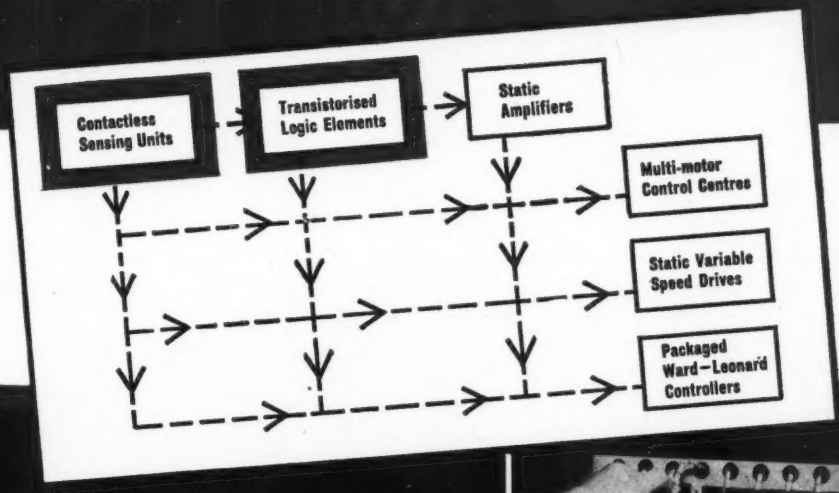

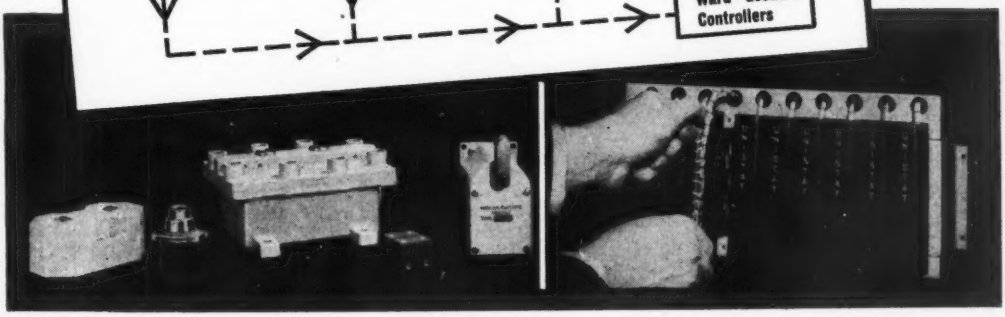

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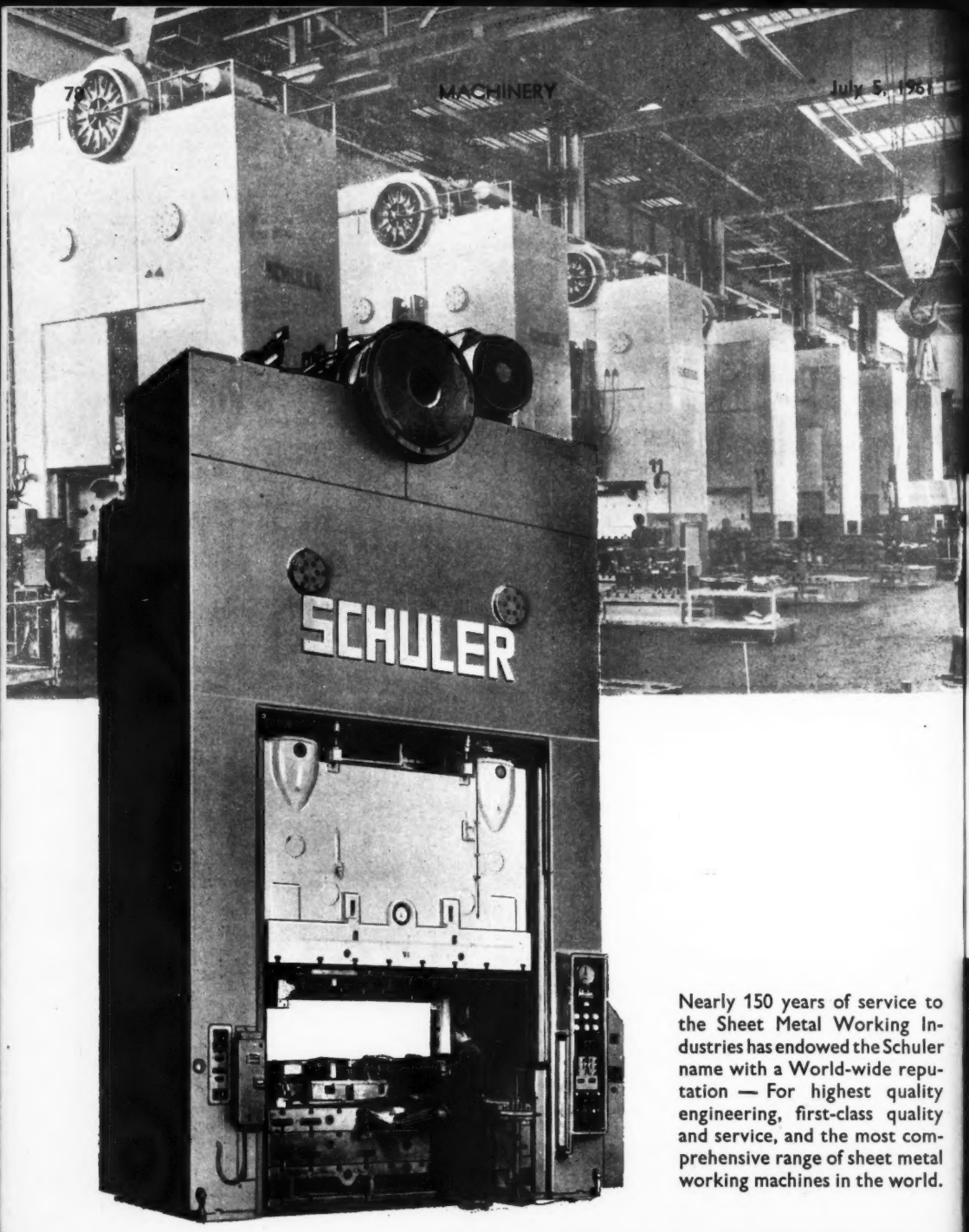

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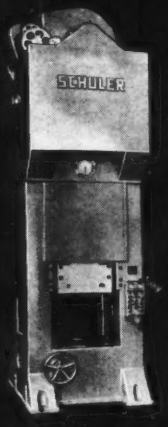
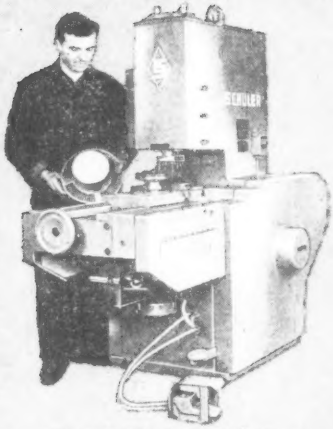


Wide Frame Toggle Drawing Presses



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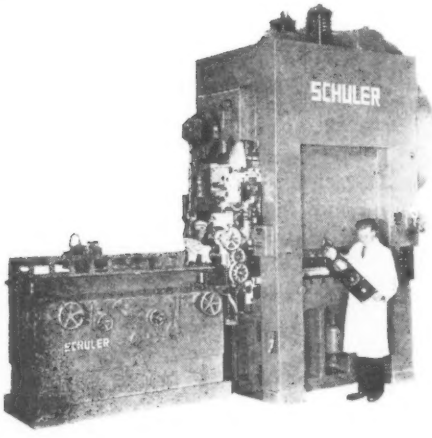

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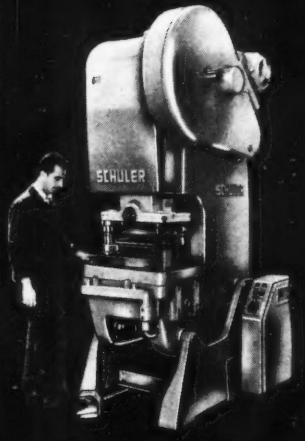

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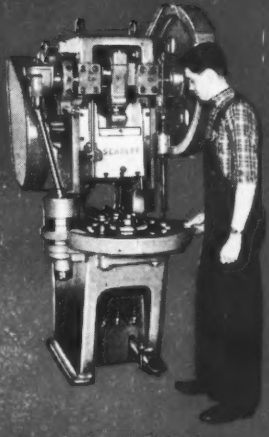

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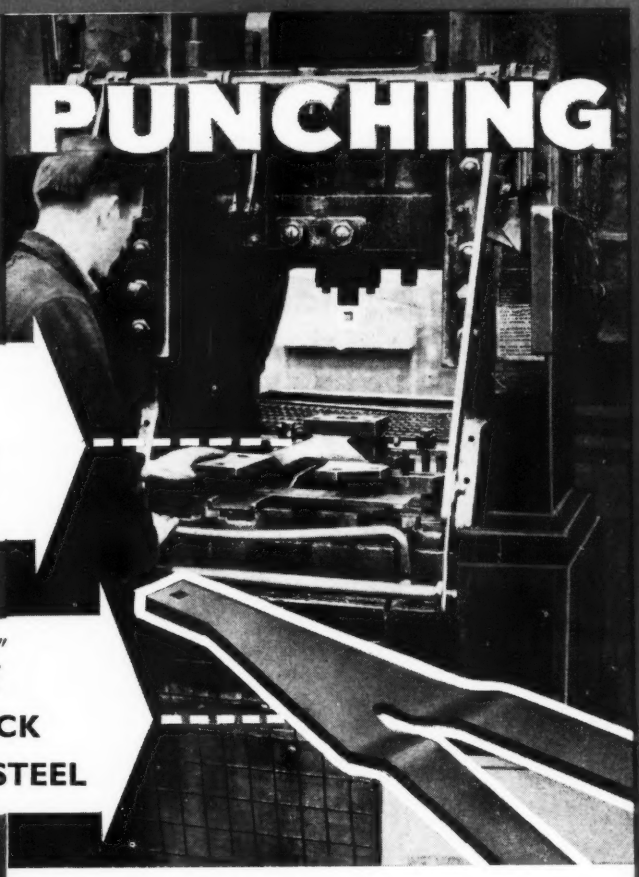

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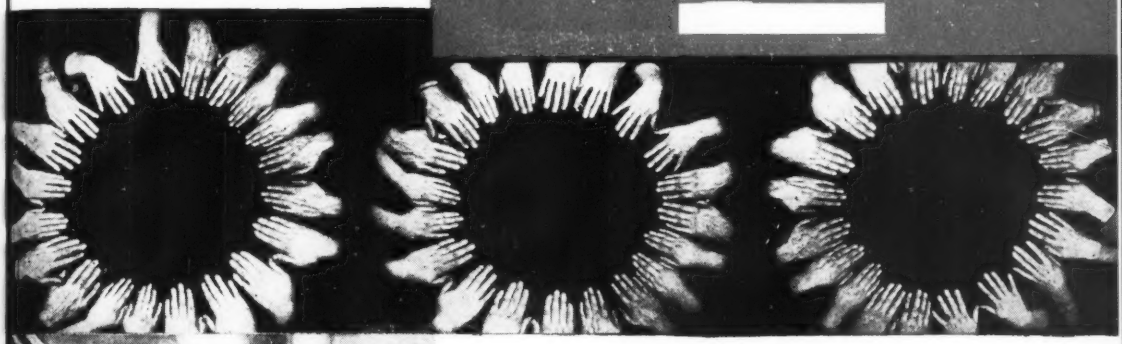

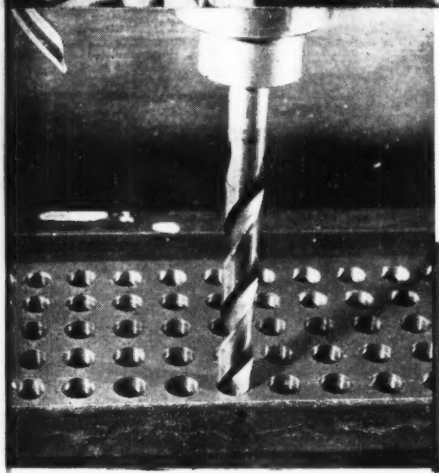

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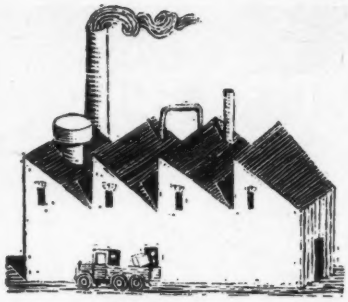

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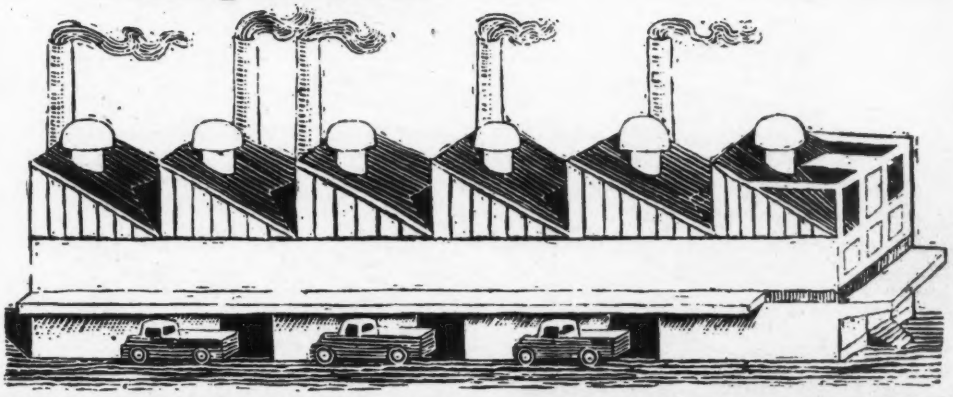

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Member of the Asquith Machine Tool Corporation

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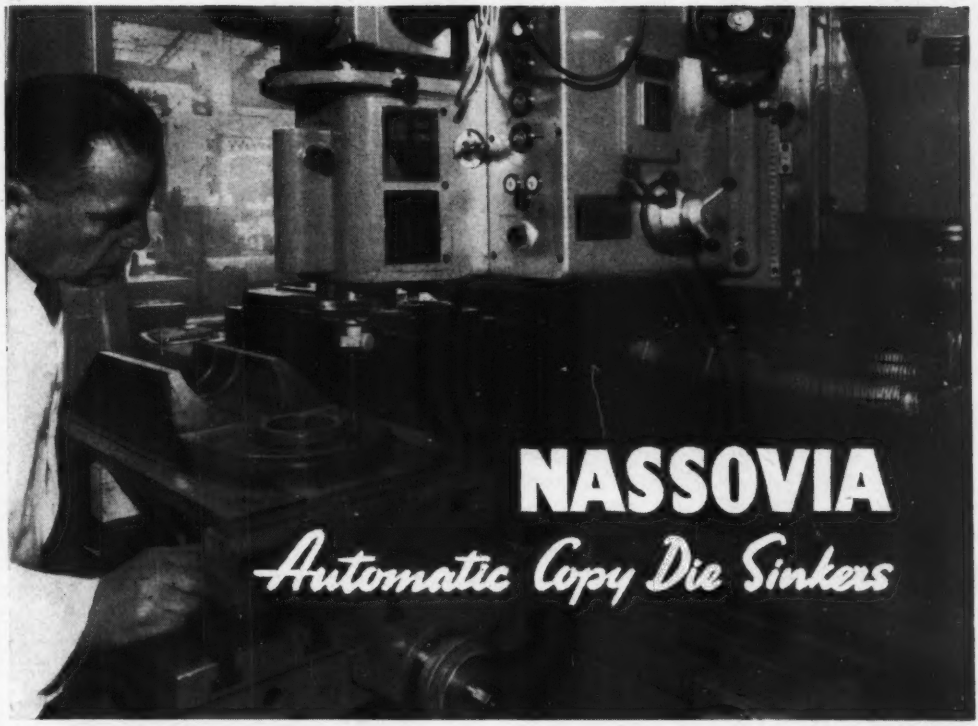

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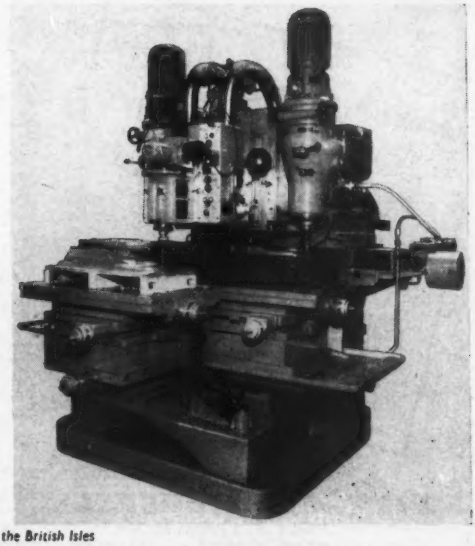

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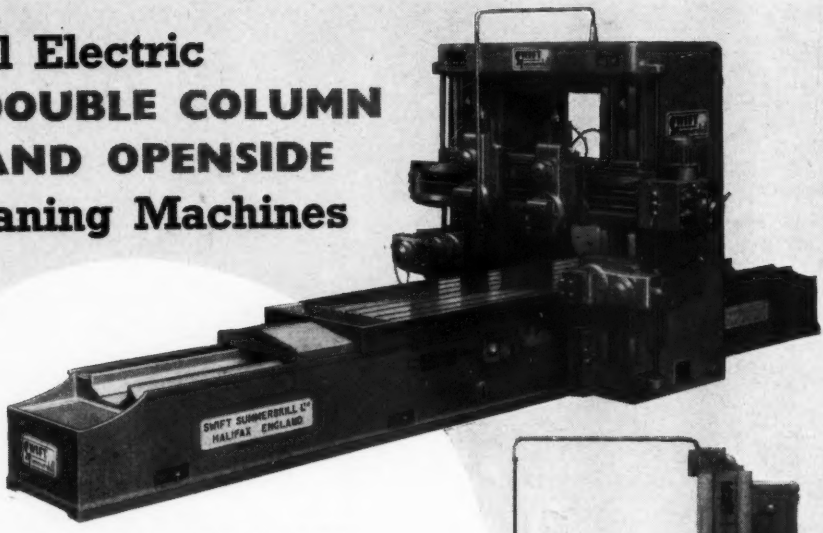
All Electric DOUBLE COLUMN AND OPENSIDE Planing Machines



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Above. Swift Summerskill Double Column Planer Type 48 SM. Capacity 10ft. 0in. by 4ft. 0in. by 3ft. 6in.

Left. Swift Summerskill Open side Planer Type 48 OSM. Capacity 10ft. 0in. by 4ft. 0in. by 4ft. 6in.

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CONTENTS

Editorial PAGE

Possibilities of Hard-particle Impregnation of Sliding Surfaces 3

Principal Articles (*For abstracts see next page*)

The Production of the SIMCA Aronde 4
Milling Operations on Oil-pump Shafts 13
Some Examples of Methods Employed for the Economical Production of Bulk-handling Equipment 17
Par-A-Matic Air-operated Drilling Units 20
Use of a Converted Milling Machine for Producing a 3-dimensional Form on a Shaft 23
Hungarian Machine Tools at the Leipzig Fair 35

Short Articles

Superconductor Electro-magnets 12
Winton Swarf Breaking Machine 16
Glacier Dry Bearings 21
Hartridge Rapidlap Lapping Machine 22
Device for Cutting Strips of Adhesive Tape 33
Autoset Omni-Track Conveyor Ball Transfer Units 33
Rust-Oleum Rust-inhibiting Protective Coatings 34
Matterson Arithmic Multi-speed Gearbox 41
The Work of P.E.R.A. 42

New Production Equipment

Vero Auto-Drill Type 5625 Tape-controlled Co-ordinate Drilling Machine 25
Barber-Colman No. 1½ Fully-automatic Gear Hobbing Machine 26
Lucas Precision Versa-Tronic Vertical Boring and Milling Machine 27
Bentley Double-column Presses 28
Mikron A21/0 Gear Hobbing Machine 28
B.O.C. Pug Portable Oxygen Cutting Machine 29
Landis Hy-Duty Thread Rolling Machine 30
Bodine No. 60 Rotary Automatic Assembly Machine 30
Veenstra Hydro-Bend No. 26 Tube Bending Machine 31
Lapointe S.P.D. 7/16 Vertical Pull Broaching Machine 32
IMR 3½ Electro-magnetic Press 32

News of the Industry

The Midlands 44
Yorkshire 46
Calor Gas (Distributing) Co., Ltd. 48
Foundry Exhibition 50
Industrial Notes 52
Scrap Metals 54
Machine Tool Share Market 55
Prices of Materials 56

Classified Advertisements 135
Index to Advertisers 167

Abstracts of Principal Articles

The Production of the SIMCA Aronde P. 4

This article, the last in the series on the production of the SIMCA Aronde, is concerned with operations on the trimming and final assembly lines at the Poissy factory. Reference is made to the building of instrument panel and steering column sub-assemblies on trolley jig lines that feed the trimming line, also to the assembly of rubber and metal components to glass panels for windows. Special equipment for feeding work material to sewing stations, a Beyroux-built multi-point sewing machine, and seat-building conveyor lines are also discussed. Finally, arrangements for mounting bodies on engine and transmission assemblies, also for testing the alignment of the front wheels and headlamps, are considered. (MACHINERY, 99—5/7/61.)

Milling Operations on Oil-pump Shafts P. 13

Two type 3R programme-controlled, automatic-cycle, production milling machines have recently been supplied by Centec Machine Tools, Ltd., Hemel Hempstead, Herts., for milling Woodruff keyways and slots in shafts for motor-car oil pumps. A third machine will be delivered shortly. Hopper feeds and a total of eight combined work-holding fixtures and auxiliary cutter heads have been supplied for handling pump shafts in five different lengths up to 7·3 in. At the set-up which is described, loading of a blank into the fixture, simultaneous milling of a keyway and a slot, and unloading of the completed pump shaft is carried out on a fully-automatic cycle in 34 to 36 sec. (MACHINERY, 99—5/7/61.)

Some Examples of Methods Employed for the Economical Production of Bulk-handling Equipment .. .. P. 17

The Conveyors Division of Hewitt-Robins, Inc., Passaic, N.J., U.S.A., have recently adopted more modern methods and machine tools for the production of bulk-handling machinery and conveyor systems. Examples quoted in this article include the use of indexable throw-away tips for machining long eccentric shafts, also for face-milling operations on frames for heavy-duty wagons. A Wiedemann turret press has recently been acquired and is employed for punching holes up to 7 in. diameter in $\frac{1}{4}$-in. thick mild steel, and holes of smaller sizes in plates up to $\frac{1}{2}$ in. thick. A special production line has been installed for idler pulleys, which includes a twin opposed-head boring machine. On this machine, lengths of tube are bored at each end with throw-away tip tools. End plates are welded in position in the tubes by means of the submerged-arc process, with equipment supplied by Lincoln Electric. Grease holes in hollow pulley shafts are punched, two at a time, instead of the more conventional drilling procedure, and the new arrangement has eliminated the need for a subsequent deburring operation. (MACHINERY, 99—5/7/61.)

Use of a Converted Milling Machine for Producing a 3-dimensional Form on a Shaft .. .. P. 23

A shaft for controlling the release of a drag-parachute from a jet aircraft incorporates a complex 3-dimensional cam form, and the latter is machined at the works of the Aero Supply Co., Inc., Corry, Pa., U.S.A., with the aid of a tracer-controlled milling machine. Basically, the machine, which is known as the Hydro-Version, is a Pratt & Whitney vertical mill which is equipped with a True-Trace head. Semi-circular 0·125-in. diameter grooves are held to $\pm$ 0·006 in., and other portions to + 0, − 0·003 in., with a surface finish not exceeding 63 micro-inches. The shaft is held in a dividing head, and the master, which is 50 per cent oversize, is gripped in an indexing head. (MACHINERY, 99—5/7/61.)

Hungarian Machine Tools at the Leipzig Fair .. .. P. 35

Products of Hungarian machine tool factories shown at this year's Leipzig Spring Fair included a hydraulic centreless grinder of new design, for plunge- or through-grinding of parts up to 2·5 in. diameter, and a small turret lathe for the production of instrument parts. A new design of turret lathe equipped for programme control of speeds and feeds by means of a plug board attracted considerable attention. Speeds and feeds can also be selected by dialling on telephone type switches, when the machine is operated under manual control. Similar equipment was applied to a series of horizontal and universal milling machines, on which speed and feed changing, direction and extent of table movements, and accurate stopping of the table in pre-selected positions, could all be controlled automatically. Another milling machine on view was equipped with a rack-cutting attachment. A range of balancing machines was also displayed, the largest of which has a capacity for workpieces weighing up to 705 lb. (MACHINERY, 99—5/7/61.)

Contributions to MACHINERY

If you know of a more efficient way of designing a tool, gauge, fixture, or mechanism, machining or forming a metal component, heat treating, plating or enamelling, handling parts or material, building up an assembly, utilizing supplies, or laying out or organizing a department or a factory, send it to the Editor. Short comments upon published articles and letters on subjects concerning the metal-working industries are particularly welcome. Payment will be made for exclusive contributions.

EDITORIAL

Possibilities of Hard-particle Impregnation of Sliding Surfaces

For many purposes—and particularly in connection with machine tools and other types of high precision machinery—it is necessary to provide guiding surfaces which will ensure extremely accurate linear movements during long periods of service. In many instances, moreover, it is becoming increasingly important to achieve a high degree of uniformity of sliding motion, especially at very low speeds, to permit the necessary degree of accuracy of positioning by means of automatic control systems of various types. With modern machining and inspection techniques, it is possible to produce surfaces which are straight, and of the required form and smoothness, within very close limits. It is also essential, however, that there should be high resistance to wear to enable the initial precision to be preserved, and that the materials employed, or the conditions of operation, should be such as to reduce friction coefficients to acceptably low values, and especially to eliminate "stick-slip" effects as far as is practicable.

There have been many developments in this field during recent years which have resulted in very substantial improvements, and in this connection attention may be drawn, for example, to the provision of guideways of hardened iron or steel, or of suitable plastics materials; to arrangements whereby the sliding member is supported on balls or rollers, or is caused to float on a film of oil or air; and to various improvements in other lubricating systems and in lubricants of both fluid and solid types.

Another approach to the problem of providing highly durable guiding surfaces, which at the same time offer very low resistance to sliding motion, was discussed by Mr. James Wells, B.Sc., in a paper submitted recently to the Institution of Mechanical Engineers. At first sight, the process described might appear most unpromising, and it is emphasized by the author that it is at present "in a purely embryonic state," and that the full possibilities and limitations remain to be explored. Briefly, the object of the preliminary investigation which has been carried out was to determine whether the excellent friction and wear characteristics of diamond could be imparted to sliding surfaces by impregnating them with large numbers of particles.

For this purpose, lapped surfaces of hardened steel were rubbed together with a small amount of diamond dust between them, aviation paraffin being employed as a lubricant. It was found that as a result of the controlled rubbing process, diamond particles were first pressed into the two steel surfaces. Subsequently, the projecting sharp edges were removed by mutual abrasion to leave "numerous small flats, or, more probably, slightly rounded pads of diamond." Two grades of diamond powder were employed for the experiments, and it may be noted that for a powder of 6-12 μ particle size, the cost (for diamond) of impregnating 1 sq. in. of surface was approximately ¼d. For purposes of comparison surfaces were also impregnated with silicon carbide and alumina powders, and whereas the former proved satisfactory, the results obtained with the latter were not successful owing to inferior "keying" of the particles in the steel.

One series of tests, the results of which are described in detail in the paper, was carried out with a stationary, impregnated steel disc and bronze pegs projecting from a rotating holder to which thrust loading could be applied. For other tests, a 1-in. diameter, impregnated, steel roller, against which a flat (impregnated) steel bar was loaded, was constrained to reciprocate through a stroke of 5-in. amplitude and rotate simultaneously.

Control tests were also made with surfaces that had been similarly prepared but not impregnated, and with surfaces coated with P.T.F.E. and treated with solid lubricant.

In general, it was found that the impregnation treatment was very effective in reducing friction and enabling much higher loads to be sustained without failure. During one control test, for instance, with a plain lapped disc, failure occurred at 600 lb. load with high friction and severe stick slip. With a similar disc, impregnated with diamond powder of 6-12μ particle size, an endurance test was conducted for 18 hours at 900 lb. During this period the driving motor failed and the rotor came to rest under the 900 lb. load without causing surface damage. Subsequently, the load was increased to 1,200 lb. for 4 hours, and then to 1,800 lb. for 2 hours. On examination there was then no measurable wear and the original random lapping marks were still visible.

Although special mention has been made of guiding surfaces, it will be apparent that the impregnation treatment could be applied to the surfaces of other components which operate in

(*Continued on page* 53)

The Production of the SIMCA Aronde

Methods and Equipment Employed on the Trimming and Final Assembly Lines for this Popular French Car in the New Factory at Poissy

By P. A. SIDDERS, Chief Associate Editor

THE PAINTING OF BODY-SHELLS for Aronde cars at the new Poissy factory of the French SIMCA organization was described in the preceding article of this series.* It may be recalled that the paint shop—one of the most modern in the world—is on the first floor at one side of the main assembly building, and provides for finishing body-shells for Aronde cars, also for the larger Vedette type, at a rate of 80 per hour. Flow of body-shells through the department, from the assembly line below, is automatically controlled, and 1-, 2- or 3-tone finishes can be applied. At the end of the painting sequence, skids are fitted to the body-shells while they are still supported on the carriers of an overhead King Dual-Duty conveyor. Shells are then carried through an opening in the paint shop floor to the trimming shop below, where there are drop sections which provide for the removal of the shells from the overhead conveyor.

Aronde body-shells are removed from one drop section and are supported on their skids on a crosswise transporter that serves six parallel, power-driven, slat-type storage conveyors at the head of the two parallel trimming lines. Between the six conveyors and the trimming lines there is a mechanized transporter, whereby a shell from any of the conveyors can be fed to either of the lines. Movement of the slat conveyors for the body-shells is controlled by an operator at an overhead station seen in Fig. 1. From this position he has an unrestricted view of the storage conveyors and the starting ends of the trimming lines, and receives instructions regarding the sequence for feeding body-shells on to the lines by way of the teleprinter A. At the end of each storage conveyor there is a red signal lamp, which is illuminated to indicate to

* MACHINERY, 95/252—19/8/59; 95/676—7/10/59; 96/748—6/4/60; 96/860—20/4/60; 96/1036—11/5/60; 97/80—13/7/60; 97/1104—16/11/60; 97/1220—30/11/60; 97/1392—21/12/60; 98/18—4/1/61; 98/236—1/2/61; 98/580—15/3/61; 98/696—29/3/61; 98/752—5/4/61 and 98/1104—17/5/61.

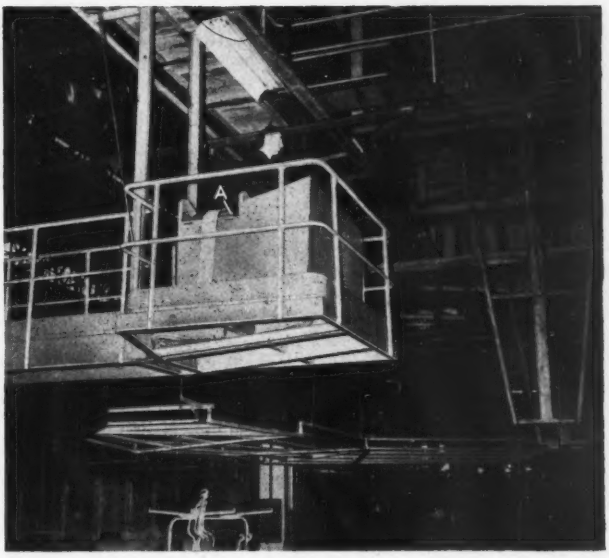
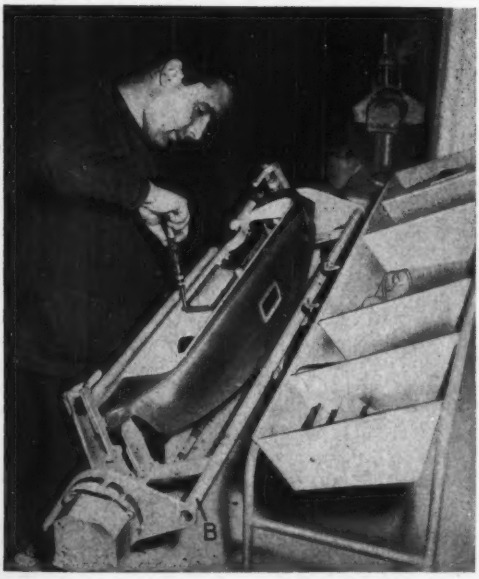


Fig. 1. To control the flow of painted body-shells from storage conveyors to the first trimming line, an operator is stationed at an overhead platform, which gives an uninterrupted view. Instructions are transmitted to the operator by teleprinter

the controller that a body-shell has been moved on to the transporter. Similar arrangements are provided for feeding body-shells to the Vedette trimming lines.

The Aronde trimming lines are approximately 820 ft. long, and are served by preparation sections at each side. Stocks of parts are maintained along the lines and are sufficient for a working period of ½ hour. A typical preparation section provides for building instrument panel sub-assemblies, by flow-line methods, and a station on this line is seen in Fig. 2. The stations are located along a track whereon move trolley jigs, one of which is seen at *B*. These jigs are advanced from station to station along the track, and at the end of the line are unloaded and placed on a second track, below the first, whereby they are returned to the starting end.



Each jig is of tubular construction, and incorporates toggle clamps for securing the housing of the sub-assembly. The jig is pivotally mounted on the associated trolley so that it can be indexed about a vertical axis to any of four positions, 90 deg. apart, and about a horizontal axis to any of six positions, 60 deg. apart. Units to be built into the instrument panel are assembled at sections to one side of the line, and are delivered to the various stations by gravity-feed racks. Assembly is carried out with the aid of air-operated portable tools, which are suspended from overhead supports. At the end of the line, the completed instrument panels are removed from the jigs, and loaded into wheeled storage racks.

A similar line is provided for building steering column sub-assemblies, and part of this line is seen in Fig. 3. In this instance, the jigs are mounted on tubular frames, which slide between channel-section rails, and a track below these rails serves for the return of the jigs to the head of the line from the unloading end. A second conveyorized

Fig. 2. A station on the line for building instrument panel sub-assemblies. Trolley jigs are employed, and power tools, suspended from overhead frames, are provided

line, at the rear, provides for building gear-change lever sub-assemblies, which are fed to the appropriate station of the first line.

AIR PRESS FOR MOVING-WINDOW SUB-ASSEMBLIES

Stations at the side of the trimming line provide for the assembly of windows and similar components, and Fig. 4 shows an air-operated press that has been designed and built by SIMCA for fitting steel and rubber channel members to the glass panels for sliding windows. Glass panels, from an outside supplier, are delivered to a position on the left of the operator, and the steel and rubber components are stored in holders on the press frame. Of the closed type, the frame is constructed from steel plate and sections by welding, and an air cylinder is centrally mounted in the upper cross-member. To the lower end of the piston rod of this cylinder is fitted a beam, which is free to rock, also to slide in the press frame, and is provided with gripping units to hold a steel channel member. This beam is indicated at *C*, and the channel is loaded with the open side downwards.

Pivotally mounted on the lower cross-member of the press frame there is a holder assembly for the glass panels. These panels may be of four types, for front or rear, left- or right-hand doors, and the holder can be indexed from front to rear to position the appropriate locations beneath the beam, and locked in the required position by means of a lever-operated, spring-loaded plunger. The upper end of the holder is swung towards the operator for loading a glass panel, and before it is moved back to the working position, a rubber channel member is fitted to the upper edge of the panel (this edge being at the bottom when the window is assembled in the car). In the working position, the holder actuates a valve, and unless the holder has been returned to this position after loading, the air supply is not connected to the ram. The operator controls the air supply by depressing push-buttons at either side of the upper cross-member of the press frame (as shown in the illustration), and this arrangement ensures that he has both hands clear of the working zone. As the beam is moved downwards, the steel channel is forced over the rubber member and the glass panel, and the rocking action of the beam ensures accurate alignment. The beam is withdrawn automatically, and the window assembly is unloaded and stacked in a " roundabout " type rack

Fig. 3. This trolley jig line provides for the building of steering column sub-assemblies, and is fed with gear-change lever sub-assemblies from an adjoining section

Fig. 4. This SIMCA-built air-operated press has been installed for assembling rubber and steel channels to sliding windows for doors. The work support can be moved to four positions to accommodate different types of glass panels

D. This rack has two tiers, each incorporating a circular wooden platform, with radial slots to receive the glass panels of the assemblies. With the equipment described, assemblies are produced at a rate of four per min.

Fig. 6. This conveyor system allows boxes of work to be delivered to any of 18 sewing machine operators from the supervisor's position, also from any operator to another along the closed-loop line

FITTING FRAMES TO VENTILATOR PANELS

Hinged glass ventilator panels, in metal frames, are fitted to the front doors of Aronde cars, in addition to the sliding windows, and different types are required for 2- and 4-door cars. Frames are assembled to both types with the aid of the equipment seen in Fig. 5, which comprises an indexing table and an air-operated press at the rear. Four fixtures are mounted on the table—two for components for 2-door cars, and two for components for 4-door cars. Each fixture incorporates a pair of vertically-disposed rubber-lined jaws, as at *E*, between which a glass panel is clamped. On either side of the pair of jaws there is a pincer-type clamp, as at *F*, one clamp of each pair being pivotally mounted. A length of channel-section rubber moulding is gripped in the clamp at one side, stretched over three edges of the glass panel, and secured in the clamp at the other side of the fixture, which is then moved down and locked in its lower setting. A chromium-plated frame, of channel section, seen at *G*, is next positioned over the rubber moulding.

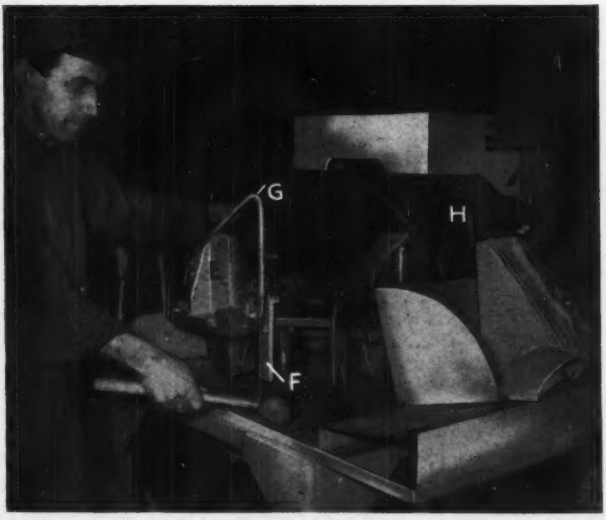


Fig. 5. Rubber channels and metal frames are assembled to hinged glass ventilators with this equipment, which incorporates an indexing table and an air-operated press

When the loading operations have been completed, a location bolt is withdrawn, by depressing a pedal, and the table is indexed through 90 deg., to locate the previously-loaded assembly beneath the air-operated press. The ram of the press is fitted with a blade-type tool *H*, and as the ram is moved downwards, this blade thrusts the metal frame over the rubber moulding and glass panel.

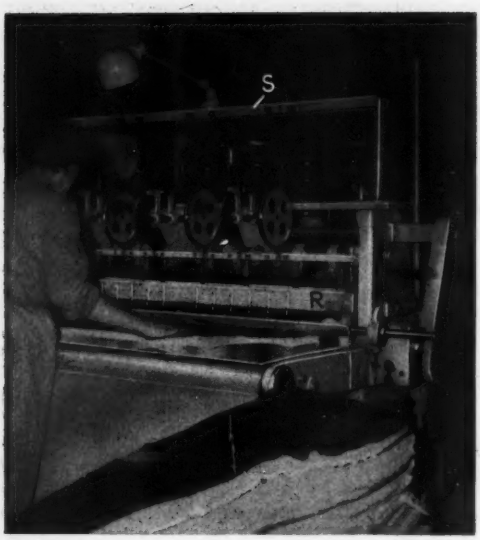


Fig. 7. Up to 12 rows of stitches can be made simultaneously with this Beyroux-built sewing machine. Needle assemblies are carried on a reciprocating beam, and the work is fed by dogs on endless chain loops

To cater for both panels, the blade is of stepped form, each step face being shaped to suit one type of assembly. Alternate fixtures are mounted at different distances from the centre of the table, so that each frame is engaged by one step face only, to suit the type of ventilator.

SEMI-AUTOMATIC WORK-DELIVERY CONVEYOR

A number of interesting items of equipment has been installed to facilitate the production of non-metallic assemblies in the upholstery section that serves the trimming line. Fig. 6 shows part of the line for stitching seat covers which comprises a closed-loop platen conveyor system, with 18 stations for sewing machine operators, one station for loading and one for unloading. Each platen, as at *J*, is inclined, and is fitted with freely-rotating ball supports. Between each run of the conveyor and the operators' stations there is an inclined metal bench *K*, also provided with ball supports, which serves to hold boxes containing work material or stitched seat covers, at each operator station.

Each platen support is provided with 18 trips, and each operator's station is numbered. At the supervisor's position, there is a control panel *L*, with two groups of signal lamps, numbered from 1 to 18. These lamps are controlled by the operators along the line, and one group is illuminated to indicate which operators are working, and the other group, which operators are awaiting work. Below the panel there are two levers, as at *M*, each of which can be moved to any of ten settings. The settings of one lever are marked in "units" from zero to nine, and of the other, in "tens" from 0 to 90, so that the levers can be set to correspond to any operator's station number. Mechanism connected to the levers provides for setting the trips on the platen supports, but this mechanism is not brought into action until a pedal is depressed. This pedal also serves to actuate a pusher *N*, which moves in slots in the bench at the side of the conveyor.

Assuming that the operator at station 16 requires more material, she presses a button to illuminate the appropriate signal lamp on the control panel. The supervisor of the line then sets one lever to 1 and the other to 6, places a box of work material on the bench, and moves it to the position in front of the pusher *N*. Next, she depresses the pedal, and when an empty platen is opposite, the pusher thrusts the box on to it, and the trips on the platen support are set. The box is retained on the platen by a bar *P*, connected to the trip mechanism, and when the platen reaches station 16, the mechanism is actuated to lower the bar, and the box of work material slides off the platen on to the bench.

Similar arrangements, for transfer of partially completed work to the platens, also for setting the platen trips, are provided at each operator's station. As each batch of work is completed, the operator initiates the movement of the box containing it on to the conveyor, and it is delivered to the operator who is responsible for the next stage in the sequence. The last operator arranges for delivery of the work to the unloading station, where the box is automatically transferred from the platen conveyor to a delivery conveyor, for transport to the next section.

Fig. 7 shows a multi-point sewing machine specially built by the French firm of Beyroux for stitching together pre-cut fabric and wadding panels. Up to 12 rows of stitches can be made simultaneously. A transverse beam *R* is reciprocated on guide pillars at either side of the machine frame, and it carries 12 needle assemblies, which are adjustable for spacing. A corresponding number of proprietary rotary shuttle units is mounted in the base of the machine, below the work, and connected to the beam-reciprocating drive system. The work material is fed between

Fig. 8. One end of a closed-loop conveyor line for making front seats. Each seat comprises a bought-out fabric-covered spring assembly, a foam rubber pad, and a cover

the needles and shuttles by means of dogs fitted to loops of chain. Cops of thread are mounted on vertical pins at the rear of the machine, above the needle bar, and the threads pass through tensioning units on the bar *S*, and over pulleys at the front of the machine, to the needles.

SEAT PRODUCTION LINES

Seats and seat-backs are produced at stations along a number of closed-loop conveyorized lines, one of which is seen in Fig. 8. Each fixture on the conveyors has two arms, approximately of L-shape, as indicated at *T* and *U*. The arm *U* is hinged to the arm *T*, and can be raised and lowered by means of a long lever at one side. A horizontal shaft extends from the arm *T*, and passes through bearings in the main support *V* of the fixture, the arrangement being such that both arms, as a unit, can be swung through 360 deg. Provision is made for locking the arms in settings at 90 deg. apart, and the index plunger is withdrawn by means of the knob *W*.

Each arm carries a platen, which is free to rotate through 360 deg. on a pivot that is at right-angles to the longer member of the arm. An interior spring assembly, from an outside supplier, is first mounted on the platen of the arm *T*, as indicated at *X*. A foam rubber pad is then laid on top of the spring assembly (which is supplied in a fabric case), followed by the outer cover. The arm *U* is then lowered so that its platen, which is of concave form, compresses the rubber pad and the springs, and the arm is locked in its lower setting. Next, the operator stretches the outer cover over the rubber pad and

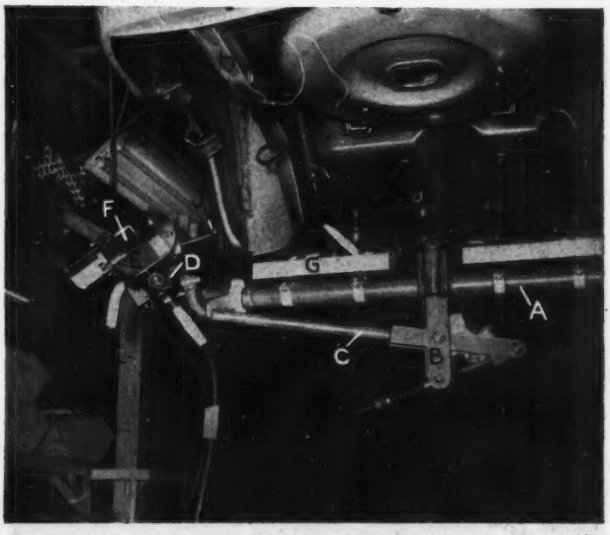


Fig. 9. At this station at the end of the second trimming line, rubber-lined bushes are pressed into the side members of the body, which is supported from an overhead conveyor. A hydraulic press unit is carried on the end of an arm that is pivotally mounted on a travelling cradle

Fig. 10. The station on the first of two final assembly lines at which the trimmed body is mounted on the engine and transmission assembly, supported on a slat conveyor

springs, rotating the assembly within the arms, and the arms on the horizontal spindle, as required. Spring clips are employed to hold the cover in position temporarily, and the operator finally secures it by staples, using the magazine-fed unit *Y*, which is suspended from a self coiling reel. A bracket *Z*, at one side of the main fixture support, carries a tray for stacks of staples and other accessories, also a rack containing wadding, which is used for padding certain areas of the seat assembly.

FITTING RUBBER-LINED BUSHES

Body-shells pass down the two parallel slat conveyors of the twin first trimming lines, and on reaching the ends of these lines, are transferred, by a transporter unit, to a single slat conveyor that forms a further trimming line, moving parallel to the first two lines, but in the opposite direction. The slat conveyor of the second trimming line is approximately three-quarters of the length of those for the twin first lines, and bodies pass down the line to a position beneath the drop section of an overhead conveyor. Here each is attached to a hanger on the overhead conveyor, and the skids are removed from the side members. The body then moves on the overhead conveyor, in the same direction as on the slat conveyor, while certain operations are performed on the portions below the floor panels.

Operations carried out at this stage include the fitting of rubber-lined bushes (for the rear suspension) to the side-members of the body. This operation is performed at the station seen in Fig. 9, where there are rails mounted on columns at either side of the line, on which runs a transverse cradle *A*. At the centre of the cradle is pivoted a yoke-member *B*, that is free to turn, and it carries a spring-counterbalanced, pivoted arm *C*. A second yoke *D* is pivoted at the end of this arm, and supports a hydraulically-operated press unit *E*. This unit is supplied with pressure-oil from a self-contained pump and reservoir assembly, at one side of the line, by way of flexible hose.

The press unit incorporates a guide channel *F*, and on the cradle there are trays, as at *G*, which

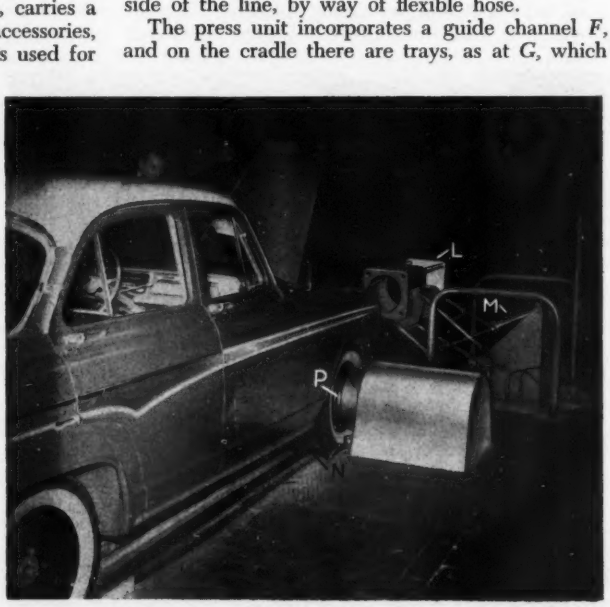


Fig. 11. This equipment is installed at the end of the second final assembly line and provides for checking the alignment of the front wheels, also the adjustment of the headlamps

Fig. 12. A view of the end of the Aronde assembly line at the Poissy plant, showing two of the stations for running and other tests on the finished cars, which are supported on rollers

contain a supply of rubber-lined bushes, also grease. A bush is first coated lightly with grease, and is then loaded into the channel *F*, after which the press unit is lifted into engagement with one side member of the body, as indicated at *H*. At one side of the press unit there is a sliding location peg, which is spring-loaded inwards, and can be withdrawn by movement of a ball-end lever *J*. The location peg is inserted in the hole in the side member, and the press unit and cradle then travel with the body.

Oil supply to the press unit is controlled by means of solenoid-valves operated by push-buttons on the body of the unit. By depressing one button, oil is directed to the hydraulic cylinder of the unit to advance the ram, which thrusts the rubber-lined bush out of the guide channel and into the side-member of the body. During this operation, the location peg is pushed out of the hole, against spring pressure. After the bush has been assembled to the side-member, the oil supply is cut off, the press unit is lowered, and the arm *C* is swung through 180 deg. to enable the press unit to be engaged with the other side member of the body, for assembling the second bush.

FINAL ASSEMBLY LINES

Bodies are carried on the overhead conveyor from the second trimming line to the first of two final assembly lines. At the starting end of the first assembly line there is a floor-mounted slat conveyor, whereon are carried special cradles to support the engine units fitted to the Aronde, also the rear axle and propeller shaft assemblies. These units are built up at sections remote from the line, the engine being delivered with the clutch and gearbox fitted, and the rear axle complete with springs. The three assemblies are coupled together on the slat conveyor, and the support for the rear axle can be adjusted on a pair of cylindrical guide members.

Beyond the stations for these operations, the slat conveyor rises approximately to chest height, as may be seen in Fig. 10, and is aligned with the overhead conveyor carrying the bodies. In this illustration, a rear axle support on the slat conveyor is indicated at *K*. Both conveyors move in phase, and the body is lowered by means of a drop section for assembly to the engine and other units. The leather covered hooks, whereon the body is hung on the overhead conveyor, are attached to the cables of self-coiling reels, and are raised clear of the work. Subsequently they are attached to the carrier of the overhead conveyor for return to the trimming line.

The slat conveyor continues at chest height along the length of the assembly shop, and before the car reaches the far end, the wheels are fitted to the front and rear axles. At the end of the line there are ramps at either side, as may be seen in the heading illustration, with which the wheels engage as the slat conveyor descends into a tunnel that houses the return run. Under its own momentum, the partially-completed car moves on to two transverse slat conveyors, level with the shop floor, and is arrested automatically with each pair of wheels on the slats of a conveyor. The two conveyors move together and carry the car sideways to a position in line with the second final assembly line, which has twin slat conveyors at floor level, the spacing of which corresponds to the track of the car.

At the end of the final assembly line there is a station for checking the alignment of the front wheels, also adiustment of the headlamps. One side of this station is seen in Fig. 11, and one of the headlamp checking units, which are of conventional type, is indicated at *L*. Both units are

mounted on pantograph linkages and can be swung inwards, from positions clear of the line, by means of air cylinders, as at *M*.

At this station—also at those preceding it—there is a pit between the tracks or conveyors for the car wheels. Equipment for checking front wheel alignment is installed on either side of the pit, and at each side there are rollers, as at *N*, driven by an electric motor. The front wheels of the car rest on these rollers and are thus rotated. Checking of the parallelism of the front wheels and the adjustment of the headlamps must be carried out with the vehicle in a fore-and-aft trim corresponding to that when it is running on the road. A system of cables, connected to air cylinders, is coupled to the underbody, and is employed to pull the car down on to the rollers, in order to compress the suspension and bring the body to its normal running height. The cables are hooked on to the car by operators in the pit.

Parallelism of the front wheels is checked by means of discs, as at *P*, which are universally mounted on the ends of horizontal rams. The discs can be advanced into contact with the wheels and are held in contact by magnets. As the wheels are driven by the rollers, the discs rotate with them, and any deflections of the discs relative to the longitudinal axis of the car are detected by a Solex checking unit, mounted on a parallelogram linkage. Wheel alignment is corrected as necessary by adjusting the track rod. After this adjustment, the cables are released, the disc-carrying rams are withdrawn, and the headlamp checking units are moved clear. The car can then be driven to one of three final test stands at the end of the line. Red and green signal lamps are provided to indicate whether the cables are connected or free.

Two final test stands are seen in Fig. 12, which is a view of the end of the Aronde final assembly line. The front and rear wheels of each car rest on pairs of rollers, the rear sets of rollers being driven by the rear wheels of the car and drive being transmitted to the front rollers. A mirror is mounted behind each car so that the tester can check the operations of the rear and stop lights. On the stand, the engine is run with each gear engaged in turn, and the brakes, horn, windscreen wipers, and lights are tested.

From the final test stands, cars pass to a retouching section, parallel with the final assembly line, and each is accompanied by a teleprinter order form (from the painting department) which gives details of finish and trimming, also a card indicating any defects that must be corrected. After defects have been made good, the car passes to a final inspection bay, and thence, by way of an underground passage, to an outside storage area and railway despatch dock.

Superconductor Electro-magnets

The fact that the electrical resistance of some metals disappears at very low temperatures has long been known. At these temperatures, the metals will carry electric current without dissipating energy, and the possibility of using such superconductors in the construction of electro-magnets was quickly appreciated. It was found, however, that with the available materials the superconductivity disappeared in the presence of a magnetic field stronger than a few thousand gauss. The metal then became a normal conductor and the flow of electric current resulted in the dissipation of energy.

Study of the problem has, however, continued, and an important advance is now claimed by the Bell Telephone Laboratories, U.S.A., with a compound of niobium and tin (Nb_3Sn). Niobium and tin, it is stated, react readily with each other to form Nb_3Sn, and the transition temperature of the compound is 18 deg. Kelvin (18 deg. above absolute zero).

The material is, however, extremely brittle, and to enable it to be wound into a coil for a solenoid, a special method of preparation has been developed. A niobium tube of ¼-in. outside diameter and 0·1-in. bore is packed with powdered niobium metal and powdered tin in the ratio of approximately 3 to 1. Since niobium and tin are ductile metals before being combined to form Nb_3Sn, it is possible to seal the tube with niobium plugs, and to reduce it mechanically, by swaging and drawing, to a wire of 0·015-in. diameter. This wire is very ductile and can easily be wound into a solenoid coil. The latter is then heated to about 1,000 deg. C., and the powders react to form Nb_3Sn. Wire resulting from this process is stated to be superconducting in fields of 88,000 gauss, while carrying currents of more than 150,000 amp. per sq. cm. It is believed that this property will be retained with fields of 100,000 gauss and possibly higher.

These new electro-magnets, it is stated, will have important applications in the field of electronic communications, and in thermo-nuclear fusion apparatus for power generation. For the latter, high-strength fields are required to provide a "magnetic bottle", to contain the high-temperature gas plasma. With the apparatus previously available, the power required to provide the "magnetic containment" represented a large proportion of that produced by the nuclear fusion reaction, and necessitated very large reactors.

Milling Operations on Oil-pump Shafts

A Set-up on a Centec Type 3R Programme-controlled Production Milling Machine

By G. W. MASON, Associate Editor

CENTEC MACHINE TOOLS, LTD., Hemel Hempstead, Herts., have recently supplied to Concentric (Engineering), Ltd., Tyburn Road, Birmingham, 24, two type 3R programme-controlled, automatic-cycle, production milling machines, fitted with hopper-fed work loading equipment and combined work-holding fixtures and auxiliary cutter heads, for milling slots in oil-pump shafts for cars. A third machine will be delivered shortly.

One of these machines is shown in Fig. 1, and a close-up view of the work-holding fixture and auxiliary cutter head assembly is given in Fig. 2. A total of eight fixtures will be supplied with the machines for handling pump shafts in five different lengths up to 7·3 in. Two Woodruff keyways are milled in certain shafts, and a single Woodruff keyway and an end slot in others.

On the type 3R machine, steplessly variable feeds from ¼ to 36 in. per min., and rapid power traverse at the rate of 300 in. per min., can be applied hydraulically to the work-table in the longitudinal direction, and to the spindle head saddle vertically, and a variety of fully-automatic working cycles can be obtained. Feed and rapid power traverse movements are controlled electrically by limit switches, operated by adjustable dogs fixed to slotted carriers, which are detachably mounted on the front of the table and the rear of the cutter head saddle. When the set-up is to be changed, each carrier—and with it a set of dogs—can be readily removed from the machine as a single unit and replaced by another pre-set assembly. Advantage is taken of this feature to facilitate changing the set-up on the machines for milling pump shafts, and separate carriers with pre-set dogs have been supplied for use with the different fixture and auxiliary cutter head assemblies.

The work-table, which measures 34¼ by 11¾ in. overall, has a T-slotted working surface of 30 by 8 in., and the longitudinal travel is 14 in. A cross travel of 2½ in. is provided for the cutter slide, and of 8 in. for the saddle on the column ways. The maximum distance that is obtainable between the centre line of the spindle and the top surface of the table is 10 in. Spindle speeds in the range from 50 to 1,400 r.p.m., or, if required, from 100 to 2,800 r.p.m., can be varied steplessly under the control of electronic equipment housed in the base. On the machines for milling pump shafts, additional electrical equipment, for controlling

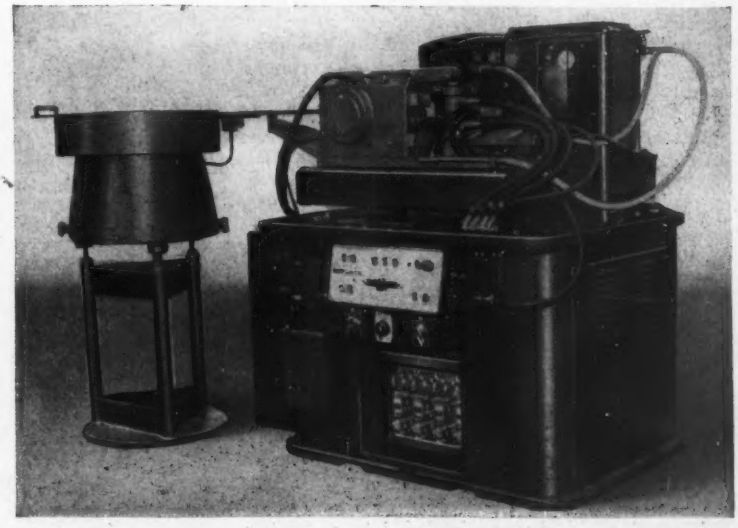


Fig. 1. Centec type 3R programme-controlled production machine fitted with a hopper feed unit and a combined work-holding fixture and auxiliary cutter head assembly, for milling a Woodruff keyway and an end slot in an oil-pump shaft on a fully-automatic cycle

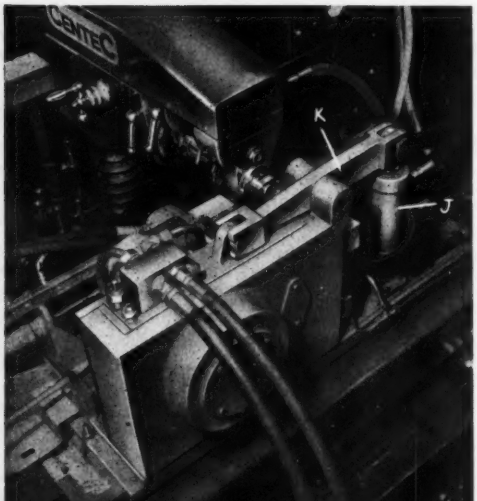


Fig. 2. Close-up view of the work-holding fixture and auxiliary cutter head unit mounted on the table of the machine shown in Fig. 1

the work-loading arrangements and the fixture and auxiliary cutter head units, is housed in a compartment in the base which normally accommodates the coolant pump and tank. A copious supply of coolant is delivered to the work by a pump incorporated in a separate floor-mounted unit, and, in addition to assisting cutting, serves to flush swarf clear of the working area.

THE AUTOMATIC SLOT-MILLING CYCLE

A No. 7 Woodruff keyway with a depth of 0·146/0·151 in., and a 0·192/0·194-in. wide by 0·440-in. deep slot are milled in the particular pump shaft handled at the set-up here described, and details are given in the line drawing Fig. 3. The shaft is made from En. 32 B steel, and after the slots have been milled, it is heat treated and then centreless ground to a diameter of 0·499/0·4995 in. Loading and unloading of the work, and the entire sequence of milling operations, is carried out on the Centec machine in a cycle time of 34 to 36 sec.

Workpiece blanks are loaded into a Syntron vibratory hopper feed unit mounted on a stand at the left-hand end of the machine, as may be seen in Fig. 1. Referring to the close-up view of the machine from the rear, given in Fig. 4, the blanks are passed by way of the chute *A* into the magazine container *B*. The hopper feed unit is operated for only part of the machine cycle to avoid "jack-knifing" of the blanks in the chute *A*, and a maximum of four blanks, stacked horizontally one on top of another, can be accommodated in the container *B*.

At the beginning of the operating cycle, a plunger, which is connected to a transfer slide at its left-hand end, is advanced, by the air cylinder *C*, to push the lowest blank in the stack from the container *B* into contact with an end stop on the fixed jaw of the vice unit *D*. Compressed air is delivered to the cylinder *C* by way of a pressure regulator, and air is discharged from the cylinder through a flow control valve, which enables the traversing speed of the plunger to be pre-set. When the plunger has been brought to the left-hand position, it operates a micro-switch, with the result that the moving jaw of the vice is closed to apply a force of ¾ ton for clamping the blank. The jaw then actuates another micro-switch, which energises a relay, and the resulting signal causes the air cylinder *C* to be reversed.

At the end of its return travel, the plunger operates another micro-switch to energize a switch at the front of the table, which forms part of the control system normally provided on the machine. As a result, the main milling head saddle is moved downwards on the column ways to bring the cutter spindle into line with the blank held in the vice. At this stage, no movement has been imparted to the table, and the periphery of the 3-in. diameter

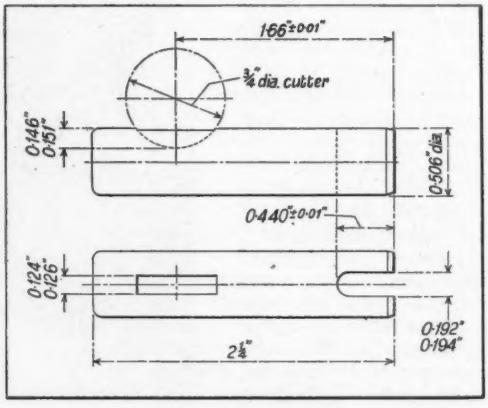


Fig. 3. Details of the pump shaft which is handled on the Centec machine. The Woodruff keyway and the slot in the end of the shaft are milled simultaneously in a cycle time of 34 to 36 sec.

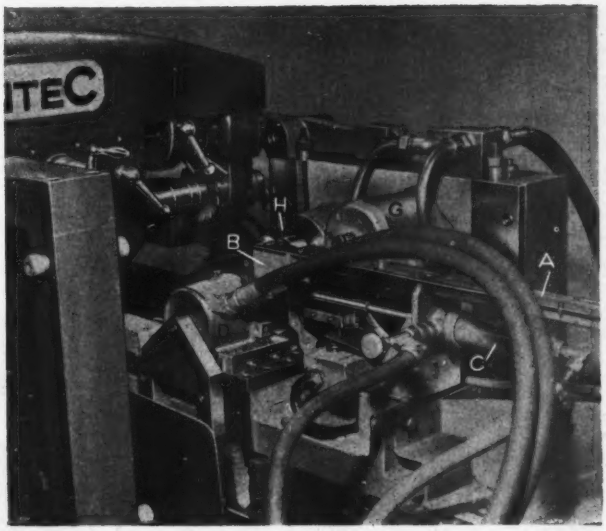


Fig. 4. This close-up view, from the rear, shows the work-loading arrangement and the main and auxiliary cutter heads

cutter on the spindle is slightly clear of the end of the blank.

When the milling slide has been brought to within $\frac{3}{16}$ in. of the end of the downward travel, one of the dogs on a slotted carrier, to which reference has already been made, operates a switch, and continued movement then takes place at reduced speed. Near the end of this travel, an abutment piece secured to the side of the milling head, as indicated at *E* in Fig. 5, makes contact with an adjustable stop mounted on the indexing bar *F*, and the latter then moves with the saddle, against the action of a spring, until a turret attached to its lower end engages with a seating ring, to control, positively, the working height of the cutter spindle. At the same time, pins mounted in the turret operate two micro-switches, one of which interrupts the hydraulic supply for traversing the saddle, and the other initiates the traversing movement of the machine work-table.

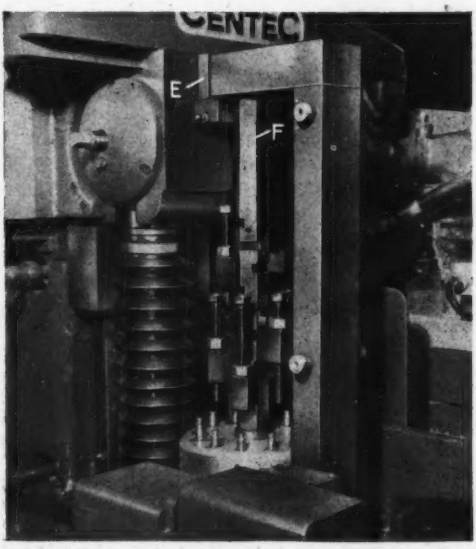


Fig. 5. Close-up view of the stops and the indexing carrier bar for controlling the working height of the cutter spindle

The bar *F* is not indexed during the particular operating cycle here described, but for other work, the six stops which it carries may be pre-set and brought into use, in turn, for automatically positioning the cutter spindle at different heights.

For plunge milling the slot in the end of the blank, the cutter spindle is run at a speed of 380 r.p.m., and a table feed of 2½ to 3 in. per min. is employed. Referring again to Fig. 4, the chute *A* is supported by a bracket secured to the fixture, and when the table is traversed to the right (as viewed from the operating position) for milling the end slot in the blank, this assembly is moved in a direction away from the hopper feed unit. As a result, a micro-switch on the hopper is de-energized to stop the vibratory action.

Simultaneously with the change-over from rapid to slow traverse of the cutter head saddle downwards, the hydraulic motor *G* is started to drive to spindle *H* which carries the cutter for milling the Woodruff keyway. The spindle is rotated at a speed of 750 r.p.m., drive from the motor being taken through a steel gear and a plastics gear, which are run dry and give a speed increase in the ratio of 2 to 1. At the same time, pressure oil is delivered to the lower end of the hydraulic cylinder indicated at *J* in Fig. 2, with the result that down feed is applied to a slide which carries the hydraulic motor and the cutter spindle assembly, by the lever *K*, for cutting the keyway. This slide is guided by

rectangular-section ways in a casting which forms part of the fixture, and a taper gib is provided to permit adjustment for wear. Down feed movement of the slide is controlled, positively, by a pair of adjustable stops. At the end of the down-feed travel, a micro-switch, attached to the right-hand end of the casting, is operated, and actuates a relay, through a timer, with the result that the cutter slide is caused to dwell to ensure that the keyway is milled to the full depth, and is then returned to its upper position, while milling of the end slot proceeds.

The hydraulic motor *G* (Fig. 4) has an extended driving shaft, the outer end of which is mounted in a bearing. Woodruff keyways are milled in pump shafts of other sizes, in the range handled by the machine, with cutters of different diameters up to a maximum of 2 in., and in certain instances, the gears which take the drive to the spindle *H*, are transposed to give a speed reduction. The working speed of the motor, also the down-feed applied to the slide, can be varied steplessly by separate hydraulic flow control valves mounted on the front of the bed. The cutter for milling the keyway is held in a collet-type chuck which is mounted in the spindle nose, and adjustments in an axial direction, for setting in relation to the centre line of the blank, are made with the aid of a key, which is passed through a hole in the guideway casting for the slide, after a cover plate has been swung to one side.

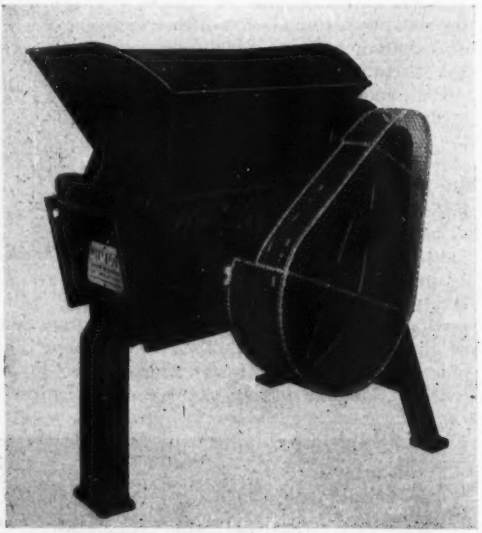
When milling of the end slot has been completed, the table makes contact with a stop, and, simultaneously, is reversed by a switch operated by one of the dogs mounted on the slotted carrier attached to the front edge. The table is now moved to the left (when viewed from the operating position) for a distance of $\frac{1}{16}$ in. at a speed which corresponds to the cutting feed, and then under rapid power traverse. When the table has been traversed through a total distance of $\frac{3}{8}$ in., the main milling head is rapidly returned to the top of its travel on the column ways.

The switch on the hopper unit is closed, so that the feeding of blanks into the chute *A* is resumed, as soon as the table has been brought to its extreme left-hand position. After the vice has been opened to release the completed pump shaft, which falls clear, the cylinder *C* is operated to load a fresh blank, and the sequence of operations is then repeated automatically.

Subsequently, the work-table of the machine is moved in the opposite direction for about $\frac{1}{16}$ in. to depress the switch which controls the downward travel of the main milling slide, and while the table is in this position, the switch on the hopper unit remains energized. The switch for the downward movement of the milling head saddle is not energized until the cylinder *C* has been reversed to return the plunger to its starting position at the end of the loading operation, as has been explained.

Winton Swarf Breaking Machine

The Winton swarf breaking machine shown in the accompanying illustration has recently been



The Winton swarf breaking machine incorporates an automatic feeding device and has capacity for 20 to 40 cwt. of swarf per hour

introduced by The Similex Manufacturing Co., Ltd., Winton Works, Wharf Street, Sowerby Bridge, Yorkshire. This machine functions by a combined bending and crushing action, and a feeding device ensures that swarf is advanced without the assistance of an operator. The crushing mechanism is so arranged that occasional bar-ends or other solid pieces can be passed through without stopping the machine.

Of all steel construction, the machine is driven by a 7½ h.p. motor mounted on the rear, through multiple V-belts, and one-shot lubrication is provided.

The complete unit is mounted on three legs to facilitate the removal of crushed swarf, and it has a capacity of 20 to 40 cwt. per hour depending on the nature of the swarf.

Some Examples of Methods Employed for the Economical Production of Bulk-handling Equipment

By R. J. AMTMANN*

THE DESIGN AND CONSTRUCTION of bulk handling machinery and conveyor systems have been undertaken by the Conveyors Division of Hewitt-Robins, Inc., Passaic, N.J., U.S.A., for nearly 75 years. Recently, more modern methods have been adopted, and new machine tools provided, which have enabled products to be improved and operations to be carried out more economically.

For the various types of vibrating machinery made by the company, combinations of eccentric shafts and counterweights are employed to provide the necessary motions. The shafts, which are from 4 to 12 ft. long and up to 12 in. diameter, are turned from hot-rolled shafting or forged blanks. Since a considerable amount of metal must be removed, any improvement in tooling and/or machining technique may result in substantial savings.

Recently, a change-over from standard brazed carbide tools to indexing type throw-away carbide inserts, and the adoption of a shock-resistant type of carbide (Vascoloy-Ramet grade VR-77), have enabled stock removal to be increased and tool life to be doubled without any sacrifice of quality standards. Large shafts are turned at a speed of 300 ft. per min. with a depth of cut of ¾ to ⅞ in. and a feed of 0·026 in.

Face-milling cutters with indexing type throw-away carbide inserts are also being used for many operations. A typical application is for machining the bearing-housing seats on the 7,500-lb. "live" frame for a heavy-duty wagon shake-out as seen in Fig. 1. With the high-speed steel cutters formerly employed, the time required for machining these seats was 2·5 hours, but they are now milled in 15 min. at a cutting speed of 550 ft. per min. The operation, which gives an improved surface (32 to 64 micro-inches finish) that is flat within 0·001 in., is performed on a Giddings & Lewis horizontal boring machine.

A Wiedemann 30-station turret punch press, as shown in Fig. 2, has recently been acquired. This machine, of 80 tons capacity, is used to punch holes up to 7 in. diameter in ¼-in. thick mild steel, and holes of smaller sizes in mild steel plates up to ⅝ in. thick.

The machine is equipped with a direct measuring gauge and table, and plates up to 72 by 200 in. can normally be handled. With minor modifications to the set-up, however, larger plates can be accommodated. The operator rides on a platform which moves in and out with the plate as it is being positioned for each punching operation. The workpiece can be moved horizontally—

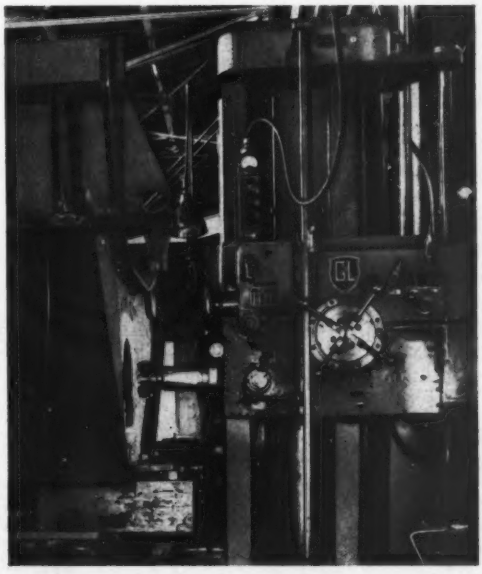


Fig. 1. Set-up for face-milling bearing-housing seats on a live frame for a heavy-duty wagon shake-out unit. The use of cutters equipped with indexing type carbide inserts has enabled machining time to be reduced and finish and flatness of the surfaces to be improved

* Hewitt-Robins Inc., U.S.A.

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Fig. 2. Holes and cut-outs in plates up to ¾ in. thick are pierced on this 80-ton punch press. The workpiece is positioned in accordance with instructions on a chart, and no laying out is required

both in and out and to left and right—in relation to the punching station by means of two power-assisted, graduated hand-wheels. Plates are positioned and punched in accordance with information on special punch charts which are prepared in advance by the methods department. The need for laying out the plates is thus avoided.

A workpiece is first located to establish the zero point and then clamped to the table. The previously prepared chart is placed on a special drum, and is read to determine the correct size of punch and the co-ordinates of the hole position. Each handwheel is then rotated to locate the plate in accordance with these readings. The average time required to position the workpiece for the punching operation is from 5 to 10 sec. When the workpiece is in position, a foot-switch is operated to trip the press.

This switch also rotates the chart drum to bring the punch size and dial settings for the next punching operation to the reading position. Although the smallest graduations on the operating dials for the work-table represent 0·020 in., hole positions can be estimated to within ±0·005 in. The part which is being punched in Fig. 2 is a vibrating machine side-plate and is made from ¼-in. thick mild steel. When a number of smaller plates is required, they are often made from one large plate which is first punched and then divided by shearing. This method permits a reduction of loading and unloading time at the Wiedemann press. Large cut-outs of various shapes are also often produced by means of a series of co-ordinated punch operations. A safety interlock prevents accidental tripping of the press until the upper and lower turrets are correctly positioned.

Idler pulleys, which are made in large numbers,

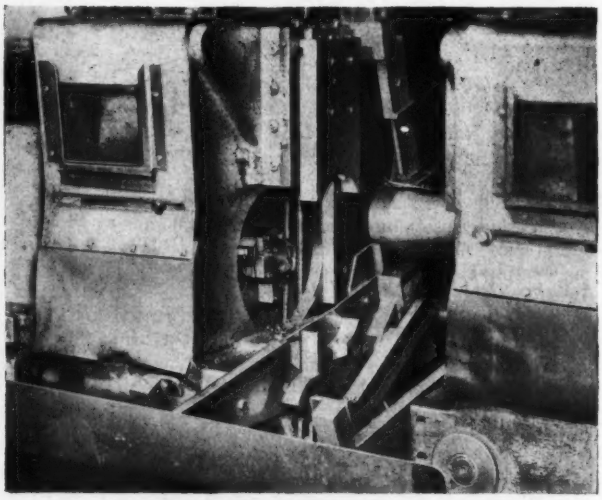


Fig. 3. Idler pulleys for conveyor belts are bored and turned at both ends on this 2-spindle machine, which operates on an automatic cycle. Throw-away carbide inserts are used in the tool-heads

are fabricated, assembled, and painted on a special production line. They are made in 2·75-, 4-, 5-, 6- and 7-in. diameters, and in lengths from 5⅛ to 81 in. Each comprises a length of steel tubing and two pressed steel heads, in which either roller or ball bearings, and seals are assembled by pressing. The pulley tubes are bored and turned at both ends simultaneously with special cutter-heads on the automatic machine seen in Fig. 3. After this operation, the tube ends beyond the shoulders are only 0·020 in. thick, and they are later crimped over to hold the heads in place for an automatic welding operation.

The boring machine has two opposed spindles, and the cutter-heads are provided with pre-set, indexing type, throw-away carbide inserts. A cutting speed of 600 ft. per min. is employed. In the illustration, a 5-in. diameter by 13-in. long pulley blank is seen on the magazine chute about to be automatically positioned and clamped for machining. About 300 pieces can be machined per edge and each insert has eight cutting edges. Thus, some 2,400 blanks are machined with a set of the Vascoloy-Ramet grade VR-75 inserts.

Previously, brazed carbide tools were used. For these tools, 15 min. was required for changing and resetting to size, and another 15 min. for grinding, and eight tool changes were generally made per shift. The carbide inserts, however, can be indexed in only 2 min.

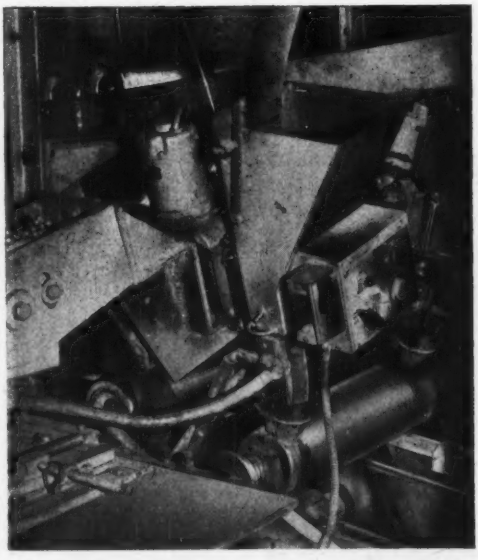


Fig. 4. With this equipment, heads are automatically welded to both ends of conveyor idler pulleys. Submerged-arc welding is employed, and the operation is completed in 30 sec.

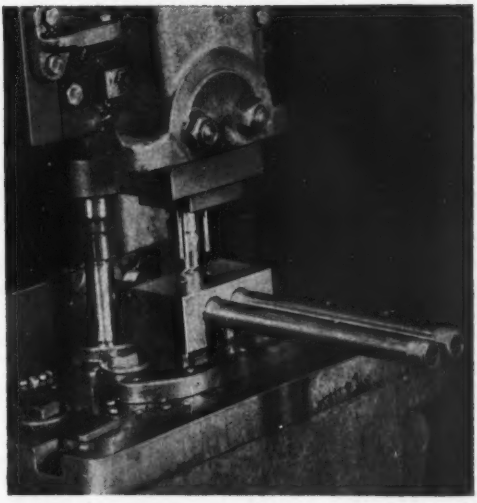


Fig. 5. Instead of being drilled, grease holes in these hollow shafts for conveyor roller pulleys are now punched in a press, two at a time. With this method a deburring operation has been eliminated

AUTOMATIC WELDING OPERATION

After being mounted in the ends of the idler pulley, the heads are welded in place with the automatic equipment seen in Fig. 4. This machine produces a circumferential weld at both ends simultaneously in 30 sec. Lincoln Electric submerged-arc welding heads are employed with a current supply of 325 to 410 amp. at 25 to 32 volts. Welding is carried out at 75 to 110 in. per min., depending on the diameter of the pulley. The parts are fed to the machine through a magazine chute and ejected automatically. About 1,000 average-size pulleys can be welded during each shift in this machine.

Another change in manufacturing technique at the plant has been the substitution of a punching for a drilling operation. Hollow pulley shafts, made from steel tubing with a wall thickness of 0·149 in., require $\frac{3}{16}$-in. diameter grease holes. These holes are now punched at a rate of 250 pieces per hour, with special tools, in the press shown in Fig. 5. Two parts are punched at a time, and deburring, which was formerly required after the drilling operation, has been eliminated.

Par-A-Matic Air-operated Drilling Units

Set-ups for Drilling Aircraft Skin Panels at the Portsmouth Works of the De Havilland Aircraft Co., Ltd.

PAR-A-MATIC AIR-OPERATED DRILLING UNITS in the Aro-Broomwade range made by Broom & Wade, Ltd., High Wycombe, Bucks., under licence from the U.S.A., can be mounted singly, or in groups, in a wide variety of arrangements, for operation on a fully-automatic cycle.

These units were described in MACHINERY, 94/605—18/3/59, and it suffices to mention here that they are available in seven types which have different spindle speeds in the range from 500 to 17,000 r.p.m. Drive to the spindle is taken from a rotary-vane type air motor through epicyclic gearing built into the 2-in. diameter body. Feed movement is imparted to the spindle by compressed air applied to a spring-loaded piston at the rear end of the body, and a 3-position valve is incorporated which enables different operating cycles to be obtained.

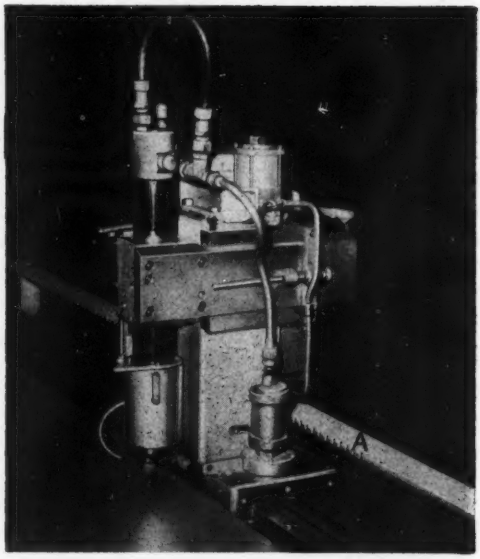


Fig. 2. Close-up view of another traversing-column type drilling machine for aircraft skin panels, which is of basically similar design to that shown in Fig. 1, but incorporates only one Par-A-Matic spindle unit

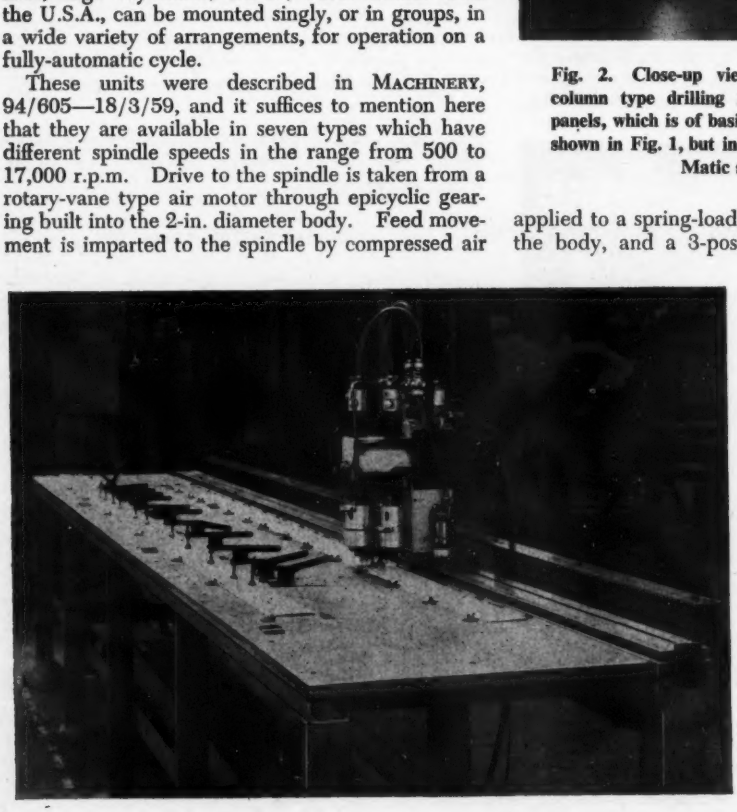


Fig. 1. Traversing-column type machine for drilling large numbers of holes in wing skins for aircraft at the Portsmouth works of the De Havilland Aircraft Co., Ltd. It incorporates two Aro-Broomwade Par-A-Matic air-operated drilling units fitted with specially designed multi-spindle heads

In the accompanying illustrations are shown two machines incorporating Par-A-Matic units, which have been

specially built and installed in the Portsmouth works of the De Havilland Aircraft Co., Ltd., for drilling large numbers of holes in wing skins for the De Havilland 121 airliner. The machine in Fig. 1 incorporates two Par-A-Matic units, whereas the machine in Fig. 2, which is of similar design, has a single unit. For performing the operations here described, the Par-A-Matic units have been fitted with multi-spindle drilling heads designed by De Havilland Aircraft Co., Ltd.

The skin panel to be drilled is secured to the table by means of clamps, and when the machine is in operation, the column assembly which carries the drilling units is traversed in a horizontal direction, on a bed member, by an air motor which drives a sprocket in mesh with a roller chain. Traversing proceeds until a micro-switch engages with a notch in the edge of a template as seen at *A* in Fig. 2, whereupon the column assembly is stopped and secured to the bed by an air cylinder. Drilling is then carried out, and at the end of the return travel of the spindle, the compressed air supply to the clamping cylinder is reversed, and the column assembly is once more traversed on the bedways until the micro-switch engages with the next notch in the template.

As an indication of the productive capacity of machines of this type, it is stated that 2,000 holes with a centre distance of 0·9 in., can be drilled in a 35-ft. long skin panel in 25 min. Since drilling is carried out on a fully-automatic cycle, one operator can tend four machines.

Glacier Dry Bearings

The introduction, some years ago, by The Glacier Metal Co., Ltd., Alperton, Wembley, Middx., of the DU range of wrapped bushes and thrust washers, afforded considerable benefits for a wide variety of applications where lubrication is undesirable, owing to the nature of the product, or is difficult to provide or to maintain by reason of location or the operating conditions. Such a bearing comprises a steel backing, lined or faced with porous bronze which is normally impregnated with P.T.F.E. (polytetrafluoroethylene) mixed with lead powder, although the latter constituent can be omitted, if required. With this form of construction, heat generated during operation is satisfactorily conducted away from the bearing surface, and advantage is taken of the low dry coefficient of friction of the plastics material—approximately 0·05, to obviate the need for regular lubrication.

More recently, the range of bearing problems to which the properties of P.T.F.E. can be applied has been extended by the introduction of other materials, also surface treatments. As mentioned in MACHINERY, 98/920—19/4/61, information relating to the application of dry bearings is contained in the Designer's Handbook No. 2, published by the company, and the recommendations concerning the newer systems are here summarized.

BEARING MATERIALS

To provide for the manufacture of small bearings, also other parts subject to wear, such as guides and locating pads, a material designated DQ and comprising P.T.F.E. strengthened with special fillers, is available in the form of bars of ¼ to 2 in. diameter and tubes of ⅝ to 2 in. diameter.

Machining operations can be carried out by conventional methods, and it is suggested that bushes should be bored *in situ*, to ensure accurate alignment. The material will, however, wear to correct any misalignment without damage to the associated journal or thrust face. With ultimate tensile strength of 875 lb. per sq. in. and yield strength in compression of 2,700 lb. per sq. in.—both values relating to a temperature of 20 deg. C.—the material is suitable for use at temperatures between −200 and +250 deg. C. DQ is not affected by many industrial liquids and gases, but for use under particularly adverse conditions, a modified type known as DQ2 can be supplied which is not attacked by any common acid, alkali, or solvent.

A characteristic of the material is that wear occurs continuously throughout the useful service life, at a rate which is proportional to the square of the rubbing velocity, and the load per unit area, and in calculations to determine the required sizes of bearings account must be taken of permissible total wear.

With the exception of the copper-based alloys, all metals which are conventionally used for journals and thrust faces can be run in contact with the DQ material. In addition, bronze can be run in contact with DQ2. The journals and thrust faces should have a finish of 16 micro-inches C.L.A. or finer

An interference of 0·005 in. per inch of diameter is recommended for retaining bushes in their housings, and when they will be subjected to wide variations of temperature in operation, there must be positive provision for preventing movement.

For reducing friction between contacting ferrous parts, which move in relation to each other and

are operated in the unlubricated condition, there is a choice of treatments whereby thin, adherent, wear-resistant coatings are applied to the surfaces, which should be ground to a finish of 16 micro-inches. Normally, a coating extends over all the surfaces of a component, and is thinner in the areas where rubbing will not occur, but selected portions may be "stopped off", if required. The company can treat components of a wide variety of sizes and shapes, which are made from any plain carbon steel and most alloy steels, but coatings cannot be deposited on the walls of small holes, of high length-to-diameter ratio. Dimensions are normally held to 0·001 in., and closer tolerances can be maintained in some circumstances.

SURFACE TREATMENT

Recommended for general-purpose use, the coating obtained by the DG (a) treatment is based on P.T.F.E., and includes a small proportion of lead. For applications where the presence of the latter constituent is undesirable, there is a lead-free DG (b) treatment, which is also more suitable for anti-fretting treatment, but gives a coating with lower wear resistance. These coatings are suitable for use at temperatures ranging from −100 to +280 deg. C., and the coefficient of friction for a treated surface, unlubricated and rubbing against steel or another similarly-treated surface, varies from 0·04 for very heavy loads and slow speeds, to 0·16. An average value, it is stated, is 0·08. Coated parts can be operated in contact with many liquids, provided that any untreated areas are not affected, and the performance is usually improved.

The treatments discussed can be applied to parts for mechanisms in nuclear reactors, subject to certain limitations. However, the remaining treatment process, which is designated DL and provides for applying a coating of molybdenum disulphide, has proved satisfactory for use where high levels of neutron flux and atomic radiation are encountered. Parts treated by the latter process can be operated at temperatures between −100 and +350 deg. C., and the coefficient of friction ranges from 0·05 to 0·20, depending on the loading and rubbing speed, an average value being 0·10. The presence of liquids cannot be tolerated, as there is a tendency for the coating to be washed away.

Some metal is removed from the workpiece during the treatment, but the surface layer which is deposited provides for a final increase of thickness that amounts to 0·0035 and 0·0025 in. when parts made from plain carbon steel are coated by the DG and DL processes, respectively. The increase of diameter of cylindrical components is double these amounts.

Hartridge Rapidlap Lapping Machine

With the bench-mounted Rapidlap machine, which has been introduced recently by Leslie Hartridge, Ltd., 151 Great Portland Street, London, W.1, the average time for reconditioning a worn nozzle from diesel engine fuel injection equipment, it is stated, is between 1 and 2 min. The unit incorporates two spindles, which carry quick-action, keyless, chucks of ⅜-in. capacity, for holding the laps.

Drive to the twin spindles is taken from a ⅓-h.p. motor, through a transmission system which includes a belt that is tensioned by an adjustable eccentric arrangement, and they run at different speeds, to suit large and small nozzles. The spindle head can be set vertically, as here shown, or can be swung downwards, about the axis of the lower spindle, to horizontal positions at either side, for the convenience of the operator. Moreover, the entire unit can be swivelled on the base, about a vertical axis. A range of steel laps up to 16 mm. diameter, also spring-loaded and reducing types, is provided, and other laps can be supplied to suit special requirements.

Hartridge Rapidlap lapping machine, for reconditioning diesel fuel injection nozzles

Use of a Converted Milling Machine for Producing a 3-dimensional Form on a Shaft

By J. E. LAIBACH*

A 3-dimensional form on a shaft for controlling the release of the drag parachute for a jet aircraft is being produced on a tracer-controlled milling machine at the works of the Aero Supply Mfg. Co., Inc., Corry, Pa., U.S.A. Designed by the company, this complex cam ensures the correct operation sequence and affords a reassuring positive "feel" for the pilot, to permit a controlled pull with definite stop positions. The release can thus be operated with a minimum of distraction during landing, when the pilot has much to occupy his attention.

* Aero Supply Mfg., Co., Inc. U.S.A.

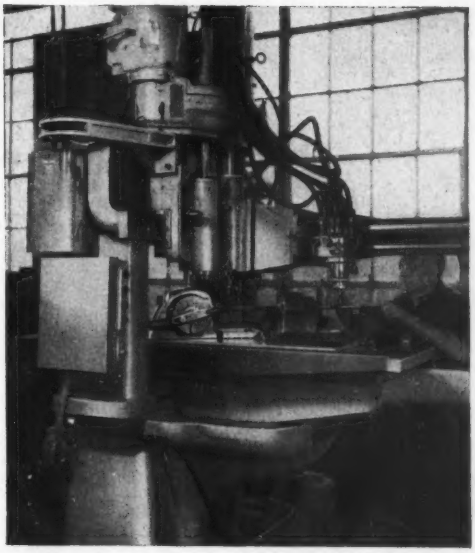


Fig. 2. The cam grooves are cut on this 3-dimensional profiler, which is a conversion of a standard vertical milling machine. A sensitive tracing head has been added, and the necessary modifications made to provide for satisfactory hydraulic response

Fig. 1. Examples of drag parachute release shafts. The blank at the right has been rough-ground preparatory to profile milling. Five completed shafts are shown turned to various positions to enable the configurations of the cam grooves to be observed

Control is obtained by means of two screws in stationary frames. The hardened and ground points of these screws ride in various grooves in the shaft. These grooves, which can be seen from a number of positions in Fig. 1, determine whether the shaft can be pulled, turned, or pushed. Recesses in the bottoms of the grooves enable the pilot to "feel" when he has reached certain positions in the sequence of operation without the need for visual checking.

For smooth, controlled-pull operation, accuracy is necessary as regards location, size, and finish of the grooves. The 0·125-in. diameter of semi-circular grooves must be held within ±0·006 in. Spherical forms

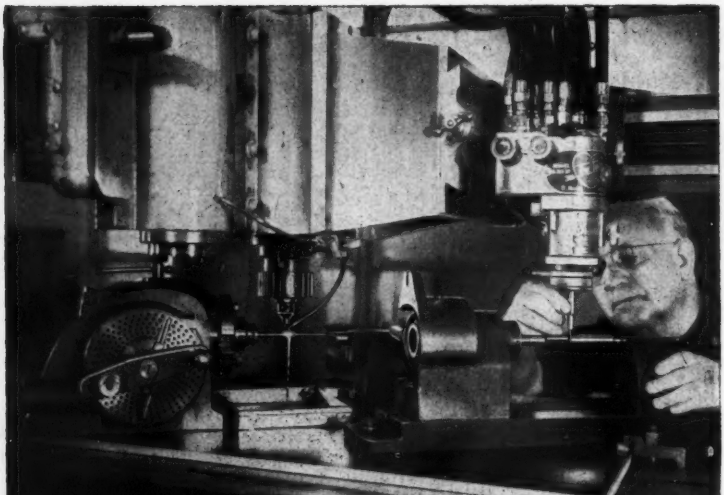


Fig. 3. The workpiece is held in a dividing head and the oversize master, on the right, is supported by an indexing fixture. Originally mounted parallel to the edge of the table, both fixtures are now set at an angle to overcome the tendency of the tool to wander slightly from a straight-line path

are held to a radius of 0·062 in., +0 −0·003 in., and groove depth to 0·062 in., −0 +0·005 in. Grooves must be parallel with each other and with the shaft centre line within 0·003 in. total indicator reading. Surface finish of the milled areas must not exceed 63 micro-inches.

The operations were performed initially on a vertical milling machine equipped with a dividing head, and two hours were then required to complete each piece.

This time was reduced by nearly 75 per cent when the work was transferred to a newly installed Hydro-Version machine (Arrow Engineering Co., Largo, Fla.) shown in Fig. 2. Production was increased to 1·9 pieces per hour, finish was improved, and rejects were eliminated. The machine is basically a Pratt & Whitney vertical miller which has been modified to receive a True-Trace head, and converted to enable hydraulically-controlled, 3-dimensional tracer machining to be performed.

Blanks are step-turned on a turret lathe from type 440 stainless-steel bar stock. Both ends are then centre-drilled, also on a turret lathe, concentricity with the main diameter being held within 0·001 in. The body diameter is rough-ground to 0·380 in. and a notch (as seen at the lower end of the third shaft from the left in Fig. 1) is milled in one end for location purposes. A hole is drilled in line with this notch and countersunk.

The workpiece is now ready for the 3-dimensional profiler on which the grooves and detents are machined with a ⅜-in. diameter end mill. A dividing head supports the shaft as seen at the left in Fig. 3, and the master, which is 50 per cent over-size, is held in an indexing head (right). When the first few pieces were machined the heads were so positioned that the workpiece and master were parallel with the direction of the table travel. It was found, however, that with this arrangement there was a slight, but unacceptable, weaving of the tool down the length of the cam grooves. To overcome this trouble, the workpiece and master were swivelled through 30 deg. to the positions shown. Tool pressure is thus maintained against the far side of the groove during the operation, to steady the end mill, and in this way the work is held within the specified limits.

Hand feed is used because the machine does not have a sufficiently low hydraulic feed rate. The depth of cut is 0·010 in., so that seven passes are required to complete each groove.

Following the profiling operation, a second hole is drilled after which the holes, slots, and detents are deburred and the sharp edges of the grooves and detents are broken. Next, the shafts are induction-hardened to 55 Rockwell C, and stress-relieved. Straightening is carried out, if necessary, before the outside surfaces are finish-ground between centres. After the shafts have again been stress-relieved, vapour-blast cleaning and surface passivation complete the sequence of operations.

EXPORT SALES OF TELEVISION SETS during January of this year reached a value of £115,000, representing a total of 3,400 sets. These figures show increases on those for the corresponding month of the previous year, when export sales were valued at £75,000, representing 2,100 sets.

NEW PRODUCTION EQUIPMENT

Edited by
G. W. Mason
and
A. J. Barker

Vero Auto-Drill Type 5625 Tape-controlled Co-ordinate Drilling Machine

Vero Precision Engineering, Ltd., Regents Park, Southampton, have recently introduced the 5625 tape-controlled co-ordinate drilling machine shown in Fig. 1. Developed from the company's earlier type (see MACHINERY, 95/1179—2/12/59), this machine incorporates a 6-spindle turret drilling head of new design, which has a capacity for drilling holes up to $\frac{1}{16}$ in. diameter in mild steel.

Whereas on the earlier machine, which has a drilling capacity of $\frac{1}{16}$ in., the spindles are mounted on an inclined circular carrier built into the head, with the new design, they extend radially, as may be seen more clearly in the close-up view Fig. 2, and the turret is indexed on a horizontal axis. With this arrangement, greater clearance is provided between the drilling spindle in the working position, and adjacent spindles. Indexing is effected by compressed air, and the turret is located, positively, at each working position, by a tapered plunger which engages with notches in a large-diameter disc. It is claimed that the indexing movement is accurate to 0·0003 in. measured at the nose ends of the spindles.

When the machine is in operation, only the spindle at the drilling position is rotated. Drive is taken from a 1½-h.p., 4-speed, pole-changing motor, through a belt and stepped pulleys, and thence by helical gears and a dog clutch, which is automatically disengaged when the turret is being indexed. Twelve spindle speeds are available, which range from 250 to 6,000 r.p.m. The drilling head has a vertical travel of 6 in., and steplessly-variable down feeds from 0 to 60 in. per min. are provided by an air-hydraulic system. Maximum feed is engaged to give rapid approach of the drill towards the work at the beginning of the cycle. Provision can be made for intermittent down feed to the spindle head, as required for deep hole drilling. A maximum distance of 20 in. is obtainable between the nose ends of the spindles and the top surface of the 36- by 9-in. work-table.

As an indication of the sensitivity of the feed system, it is stated that during tests, 0·028-in. diameter holes were drilled for considerable depths in mild steel, and that very satisfactory drill life was obtained.

Adjustable stops are provided for engaging the cutting feed and for controlling the spindle head travel, and it is stated that holes can be drilled to an accuracy of ±0·002 in. for depth. If required, duplicate sets of stops can be fitted which can be brought into use independently, under tape control, for instance, when holes are to be drilled, tapped, or counterbored, at different levels in a casting. The drilling spindles run in pre-loaded taper roller bearings, and are usually fitted with No. 2 Morse taper sockets which can be adjusted axially. Tapping attachments are available in two sizes which have capacities for cutting threads up to $\frac{1}{16}$ and $\frac{5}{16}$ in. diameter. At the end of the downward travel of the spindle,

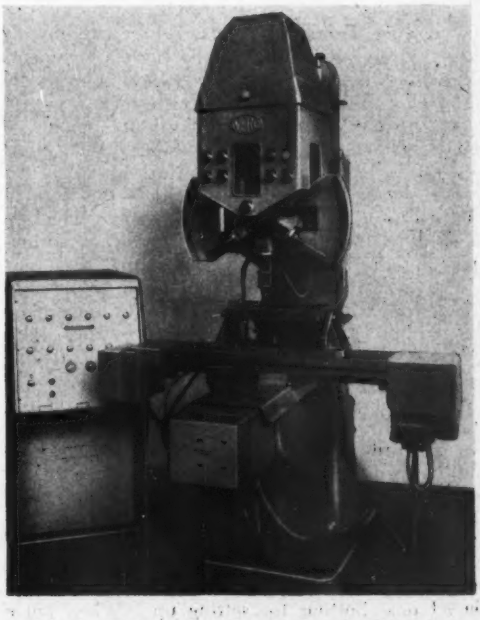


Fig. 1. The new Vero Auto-Drill type 5625 tape-controlled co-ordinate drilling machine

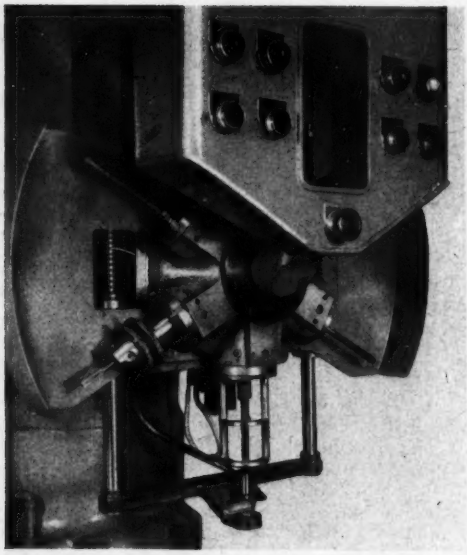


Fig. 2. Close-up view of the 6-spindle turret drilling head on the machine shown in Fig. 1

the driving motor is reversed for withdrawing the tap from the work. Guide bush attachments for twist drills can be provided when holes are to be drilled in the work to close tolerances for centre distance. One of these attachments is shown mounted on the turret of the drilling head in Fig. 2. During the downward travel of the spindle head, the guide bush enters the bore of another bush incorporated in a bracket which is secured to the lower ends of a pair of spring-loaded guide bars.

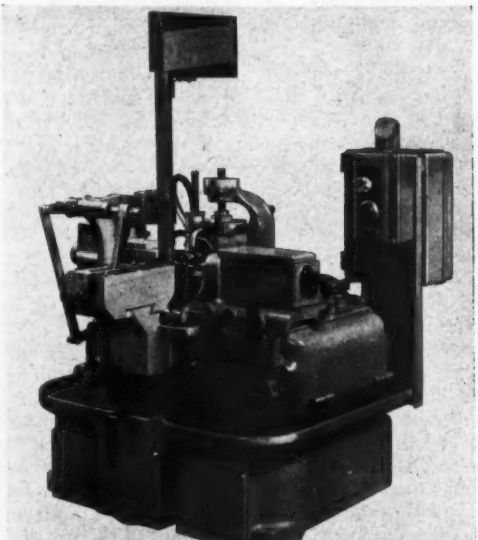
The work-table has a longitudinal traverse of 22 in., and a cross traverse of 12 in., and, as on the earlier machine, co-ordinate settings, also indexing and vertical movement of the drilling head, and selection of different spindle speeds, are controlled by Airmec punched tape equipment. With this system, it is stated, the table can be positioned to an accuracy of $\pm 0{\cdot}0005$ in. Alternatively, table settings can be made with the aid of dials mounted on the Airmec control unit. Coolant equipment can be provided, and, if required, the pump can be automatically started and stopped under tape control. Movements of the drilling head can be controlled by conveniently-placed push-buttons for setting up. When fairly large-diameter holes are to be drilled in the work, clamps can be provided for the table and cross-slide, and these are automatically released and applied under tape control at the beginning and the end of the positioning cycle.

Catmur Machine Tool Corporation, Ltd., 103 Lancaster Road, London, W.11, are the sole agents for Vero Auto-Drill tape controlled drilling machines.

Barber-Colman No. 1½ Fully-automatic Gear Hobbing Machine

At the Machine Tool Exposition in Chicago last year, the Barber-Colman Co., Rockford, Ill., U.S.A., who are represented in this country by Barber & Colman, Ltd., Marsland Road, Brooklands, Sale, Cheshire, demonstrated the new No. 1½ hobbing machine here shown. Intended for the production of instrument gears from such materials as brass, aluminium, and phenolic plastics, this machine has a capacity of 1 in. diameter by ½ in. face width, the maximum d.p. in brass being 24, and in steel, 36. Outputs up to 1,000 per hour can be obtained.

Workpieces are delivered from the overhead magazine to a shuttle-type transfer unit, for loading into the work-spindle, and the machine is fully automatic in operation, the cycle including a deburring stage. The work carriage slides on anti-friction ways and the hob spindle, for which speeds

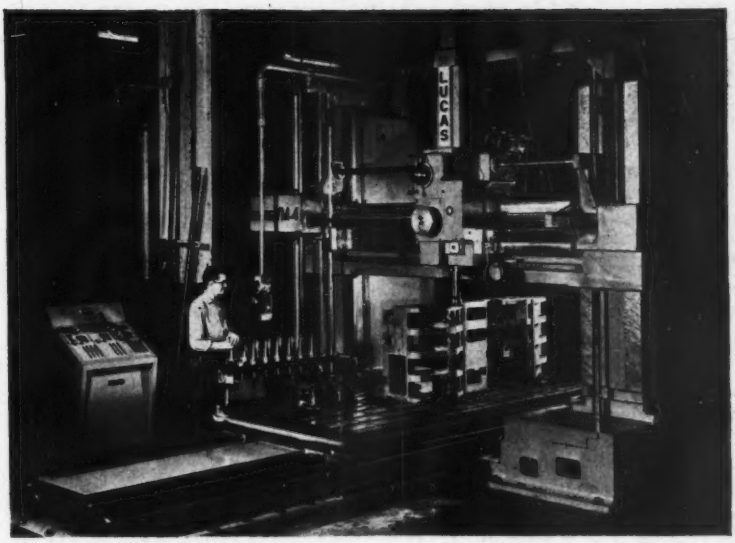


This Barber-Colman 1½ gear hobbing machine is equipped with an overhead magazine and a shuttle-type transfer unit for fully automatic operation

up to 4,084 r.p.m. are obtainable, runs in anti-friction bearings. Provision is made for accurately adjusting the hob position. All shafts on the machine are mounted in needle roller bearings.

Lucas Precision Versa-Tronic Vertical Boring and Milling Machine

In the accompanying figure is shown the precision Versa-Tronic electrically-controlled vertical drilling, boring, tapping and milling machine, which has been introduced by the Lucas Machine Division, New Britain Machine Co., Cleveland, Ohio, U.S.A.



Lucas precision Versa-Tronic vertical boring and milling machine

Measuring 12 ft. 2 in. by 5 ft. 6 in., the table has longitudinal T-slots in the working surface, and lateral slots are also provided to facilitate location of the workpiece. It can be traversed through a distance of 11 ft. along two rectangular-section hardened and ground ways on the bed casting, which is 23 ft. 4 in. long. The spindle head is carried on a cross-rail, which has a traverse of 72 in. on ways at the front of the columns.

Adjustment of the cross-rail does not form part of the automatically-controlled cycle, and is carried out before machining is begun. To enable the rail to be set accurately, dial gauges are provided and can be used in conjunction with length bars. A sleeve, which is mounted in the head in taper roller bearings, carries the spindle, and the latter has an axial travel of 24 in. It is taper bored at the nose end, for shank-type tools, and provision is also made for mounting face milling cutters up to 14 in. diameter.

Main drive is taken from a 20-h.p. motor, which is housed—together with the speed and feed gearboxes—in the base of the left-hand column. Drive for all the traversing motions, and for axial movement of the spindle, is transmitted through precision screws, and micrometer-type dials provide for accurate hand setting.

General Electric Mark III control equipment is employed, and is housed in the console seen at the rear of the bed. By means of a selector on this console, the machine may be set for fully-automatic, semi-automatic, or manual operation. For the latter, all the motions are controlled from a pendant unit.

With the fully-automatic system, the dimensional data necessary for positioning the table, the spindle head, and the spindle axially are supplied by a 1-in. punched tape. The slides and the spindle can be adjusted simultaneously or separately, as required, and are positioned from a reference point, which may be moved electrically $\pm 0{\cdot}2$ in. from a nominal setting, to facilitate setting the workpiece. During positioning by the "standard" system, the moving member is traversed to within 0·2 to 0·3 in. of the target point at a rapid traverse of 75 in. per min. Final movement is at a creep rate of 1·1 in. per min., and this motion is always applied in the same direction to each member, to avoid the risk of inaccuracy due to backlash. Alternatively, a "coarse" system can be employed, whereby the entire positioning movement is carried out at rapid traverse. The tape control also enables a total of 25 spindle speeds and 42 feed rates to be obtained. Provision is made for automatic tool changing, and the arrangement is similar to that employed on the horizontal machines, as described in MACHINERY, 97/1125—16/11/60.

Various operating cycles and functions can be selected which, after being initiated, are completed without the necessity for further tape reading, and

these include sequences for coarse and fine boring, spot-facing, tapping, and milling, orientating the spindle for tool changing, and positioning by the standard and coarse systems.

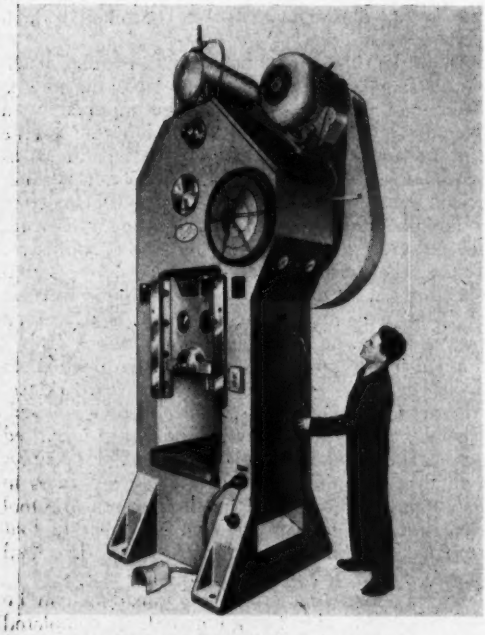
When the machine is used with semi-automatic control, dimensional information is supplied by means of decade push-buttons on the console, and it is claimed that the moving members can be set to within 0·0001 in. with this method of operation. Feeds and speeds are obtained manually by means of the pendant unit.

Lucas machines are marketed in this country by Vaughan Associates, Ltd., 4 Queen Street, Curzon Street, London, W.1.

Bentley Double-column Presses

Double-column, non-inclinable type presses, of 60, 100, and 200 tons capacity, have recently been added to the Bentley range built by Samuel Griffiths (Willenhall), Ltd., John Harper Street, Willenhall, Staffs, and the medium size of this series is shown in the accompanying illustration.

Moving in four long guideways, the ram may have various stroke lengths up to 8 in., and the maximum daylight obtainable over the 32- by 26-in. table—which has a 15¾-in. diameter aperture—is 22 in. Vertical adjustment of 4 in. is provided. Drive is taken from a 10-h.p. motor, through a 16-in. diameter, air-operated multi-plate clutch and brake, and the working speed is 40 strokes per min.



Bentley 100-ton double-column press

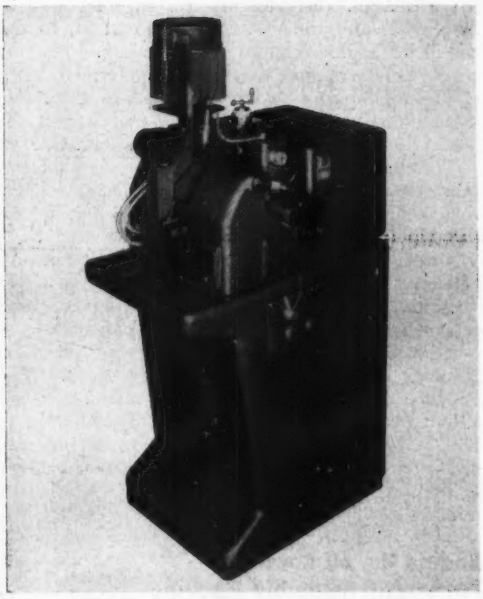
The clutch can be controlled by hand or foot, and may be set by means of a selector switch for single-stroke or continuous operation of the ram, also for inching.

Mikron A21/0 Gear Hobbing Machine

The range of machines built by Mikron Works, Ltd., Switzerland, for whom the sole agents in the United Kingdom are Henry Turner (Machine Tools), Ltd., 58 Upper Tooting Road, London, S.W.17, has been extended recently by the addition of a gear hobber which is designed for operation on a hydraulically-controlled automatic cycle, and can be supplied for fully automatic working, as seen in the illustration. Designated A21/0, this machine is equipped with a vibratory bowl feeder, from which blanks are delivered by vertical guide rails to a loading unit. The speed of operation of this unit can be steplessly varied, and for the production of small batches, the machine can be set by means of a switch for manual loading. Ease of setting-up has been studied, and it is stated that an average time for changing over from one job to another, for automatic production, is 2 hours.

Hobbing can be performed by the climb or conventional methods, which are selected by a switch, and the operating cycle may be set for plunge-cutting, the hob then being rapidly advanced from below the blank, fed in, and finally returned rapidly to the starting position. Alternatively, the hob can be advanced, fed to the full depth of the tooth to be cut, then traversed longitudinally, and finally returned to the starting position. With either sequence, a hydraulically-operated de-burring tool is advanced into the working position during withdrawal of the hob. This tool is mounted vertically, above the blank, and can be adjusted angularly and for depth.

The machine has a capacity for cutting gears up to $1\frac{3}{16}$ in. diameter by $1\frac{3}{16}$ in. face width, with numbers of teeth from 6 to 390, and up to 25 d.p. in steel. Drive to the hob spindle is taken from a 1-h.p. motor through a belt, and 9 speeds from 400 to 4,800 r.p.m. are obtainable, which enable tungsten carbide hobs to be used to full advantage. Concentricity of the spindle is maintained without the need for adjustment, and the design of the bearings is such as to permit the use of diamond hobs. Steplessly-variable longitudinal and plunge feeds ranging up to ¾ in. per sec. are applied hydraulically, and can be changed indepen-



Mikron A21/0 hydraulically-controlled, fully-automatic, gear hobbing machine

dently by means of knobs mounted below the work-head and on the column. Travel of the operating pistons is controlled by stops, which accurately limit the feed movements. Separate motors of 0·1 h.p. are provided for driving the hydraulic pump, which also supplies a push-button-controlled system for lubricating the slideways, and a coolant pump. It may be noted that the flow of coolant is interrupted while unloading and loading is being carried out.

Drive to the work spindle is transmitted through readily-accessible change gears, and the indexing wheel, which runs in an oil bath, can be adjusted to take up play. The spindle is arranged to take collets, which are operated by a quick-acting hydraulic unit, and the tailstock is normally of the hydraulic type, although other forms are available as extra equipment. A lever at the right-hand side of the machine provides for clamping the work under hand control.

Designated 21/0, a semi-automatic version of this machine is available, the work spindle of which can either be equipped with a collet or arranged for use in conjunction with a work arbor. A hand-operated tailstock is usually provided, which normally incorporates a bayonet arrangement for securing the barrel in the extended position. Air- and hydraulically-operated tailstock units are, however, available as extra equipment, the latter being suitable for workpieces up to ¾ in. diameter, and there is a quick-acting hydraulic unit for work-head collets. With the addition of another special unit, power-operated clamping units on the headstock and the tailstock can be controlled by a single lever. This lever also permits control of the speed of movement of the tailstock barrel in both directions, as is desirable for clamping delicate blanks. With this machine, it is stated, an average time for changing over from one job to another is 10 min.

B.O.C. Pug Portable Oxygen Cutting Machine

The Pug portable oxygen cutting machine shown in the illustration has recently been introduced by British Oxygen Co., Ltd., Bridgewater House, St. James's, London, S.W.1, and was shown at the Engineering, Marine, Welding and Nuclear Energy Exhibition earlier this year.

Weighing only 21 lb., this machine enables straight-line and bevel cuts to be taken on mild steel plates up to 2 in. thick. For straight-line cutting, it is guided on a light alloy extending-type track, as shown, and the traversing speed can be varied from 10 to 180 ft. per hour by a rotary-type resistance. A universal driving motor, designed for operation on a supply of 110 or 220/240 volts, can be provided, and the power

B.O.C. Pug portable oxygen cutting machine

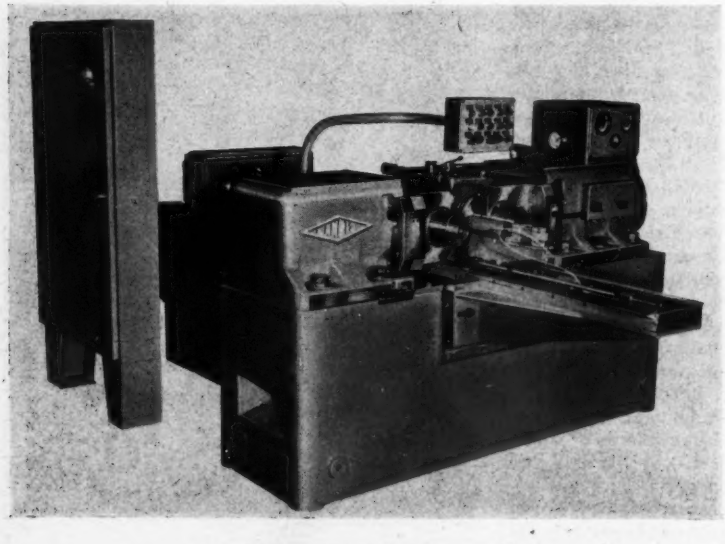
consumption is 80 watts. An adjustable trammel attachment is available for cutting circles from 3 to 45 in. diameter. Of the nozzle-mixing type, the burner head is designed for operation with either acetylene or propane gas, and can be adjusted horizontally and vertically, and swivelled through a maximum angle of 45 deg.

Landis Hy-Duty Thread Rolling Machine

Landis Machine Co., Waynesboro, Pa., U.S.A., who are represented in this country by Alfred Herbert, Ltd., Coventry, have recently introduced the Hy-Duty machine here shown, which has capacity for rolling threads on work up to 6 in. diameter by the in-feed method, the maximum thread length then obtainable being 11½ in. Threads up to 20 in. long can be produced when through feeding of the work is employed, and the maximum diameter that can be accommodated with this method is 4 in.

A force up to 200,000 lb. can be applied to the work, and the roll carriers normally provided incorporate 4½-in. diameter spindles of heat treated alloy steel. To absorb the radial loads, each of these spindles is mounted in a heavy-duty roller bearing at the work-entry end, and two similar bearings at the driving end, with a ball thrust bearing interposed between them. Axial adjustment of ⅛ in. is provided for the spindle, which can float against thrust loads applied by compression springs while rolling is in progress. Rolls up to 12 in. diameter by 12 in. long can be employed, and the carriers can be tilted, to suit the helix angle required on the work. For use where lighter operations are to be peformed, interchangeable carriers which incorporate 3-in. diameter spindles can be supplied, and permit the use of less-expensive rolls, up to 8 in. diameter.

To ensure the necessary rigidity, the bed is fabricated from 3-in. steel plate. Drive for the rolls is taken from a 2-speed, 50/25-h.p. motor, through a gearbox and worm gearing, and there is a total of 12 speeds from 39 to 476 r.p.m. An efficiency of 90 per cent is claimed for the transmission at the maximum speed. Roll advance and return is effected hydraulically when rolling is performed by the in-feed method, and provision is made for adjusting the stroke length. The machine can be set for operation manually, semi-automatically, or fully-automatically, and with the latter system of working, movements are imparted to the roll carrier under electronic control, at steplessly-variable rates up to 25 strokes per min.

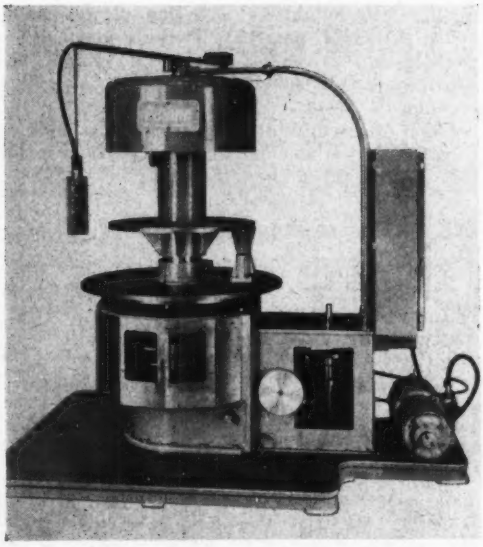


Landis Hy-Duty thread rolling machine

Bodine No. 60 Rotary Automatic Assembly Machine

The Bodine Corporation, Bridgeport, Conn., U.S.A., have recently introduced the No. 60 rotary automatic assembly machine, which will accommodate larger workpieces and perform a greater number of operations than the earlier machines of this type. It can be supplied completely equipped to suit requirements, or without tooling as seen in the illustration.

Fixtures and tooling are mounted on the large-diameter indexing dial plate and the smaller stationary central plate. Equipment can also be attached to the faces of the polygonal bed, the top face of the transmission housing at the right-hand side, and the base. Indexing of the dial plate is controlled by a camshaft, and the latter also provides for actuating tools for such operations as coining, staking, crimping and



Bodine rotary automatic assembly machine

inserting, which are thus performed in the correct sequence. Moving parts are automatically lubricated.

Representatives for the Bodine Corporation in the United Kingdom are George H. Alexander Machinery, Ltd., 82-84 Coleshill Street, Birmingham, 4.

Veenstra Hydro-Bend No. 26 Tube Bending Machine

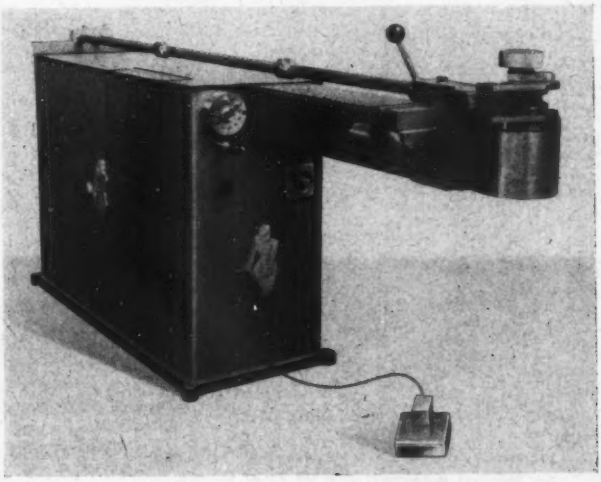
The Dutch-built range of bending machines marketed in this country by W. Veenstra & Co. (England), Ltd., 14 Valencia Road, Stanmore, Middx., has recently been augmented by the addition of the Hydro-Bend No. 26 here shown. This hydraulically-operated, mandrel-type machine has capacity for bending, through angles from 5 to 180 deg., tubes up to 1 in. diameter, with wall thicknesses up to 14 s.w.g., and is available in three sizes, to take mandrels approximately 6 ft. 6 in., 11 ft. 6 in. and 16 ft. 6 in. long.

Bends with maximum and minimum radii of 4 and 1⅜ in. can normally be produced, but the shaft of the bending head can readily be replaced, to permit smaller radii to be obtained. To facilitate the removal of square-section tubes, after bending has been completed, a divided forming member is available which is closed and opened automatically prior to the bending and return strokes, respectively. The angle through which the tube is bent is set by means of adjustable stops in an indexing turret, which enables a maximum of 12 different bends to be made in a pre-determined sequence. After the completion of the final operation, the system is automatically re-set in readiness for the next sequence. Adjustable stops are provided to control the lengths between successive bends.

During the bending cycle, which is initiated by means of a remote pedal control, clamping and release of the work and return of the forming member are effected automatically. The pressure roll is normally moved by hand to the closed position, but this motion can also be applied automatically, if required. Equipment can be incorporated for withdrawing the mandrel at a pre-determined stage, and when this arrangement is employed for tubes other than of square sections, the completed work is thrust away from the forming member when the latter returns, to facilitate removal.

Pressure oil for the hydraulic system is supplied by a constant-delivery pump, which is driven by a 5-h.p. motor. Provision is made for adjusting the bending speed, and a by-pass valve is incorporated whereby the forming member can be returned at double this rate.

Weighing approximately 12¾ and 14¾ cwt., the smallest and largest machines are 7 ft. 3 in. and 17 ft. 2 in. long, respectively.



Veenstra Hydro-Bend No. 26 tube bending machine

Lapointe S.P.D. 7/16 Vertical Pull Broaching Machine

In the accompanying illustration is shown the S.P.D. 7/16 "bench height" vertical pull broaching machine, which has been added to the range built by Lapointe Machine Tool Co., Ltd., Otterspool, Watford By-Pass, Watford, Herts. A maximum pull of 7,000 lb. can be exerted on broaches up to 21 in. long, and the stroke length can be varied up to 16 in. If required, extra equipment can be supplied which enables surface broaching to be performed.

Bored 1·5 in. diameter, the cross-head is guided throughout the full working stroke, and the pull is applied co-axially with the broach. Movements are effected hydraulically, under the control of push-buttons at the front of the machine, and to ensure the operator's hands are clear of the working area before cutting begins, buttons at the left- and right-hand sides must be depressed simultaneously in order to initiate the downward stroke.

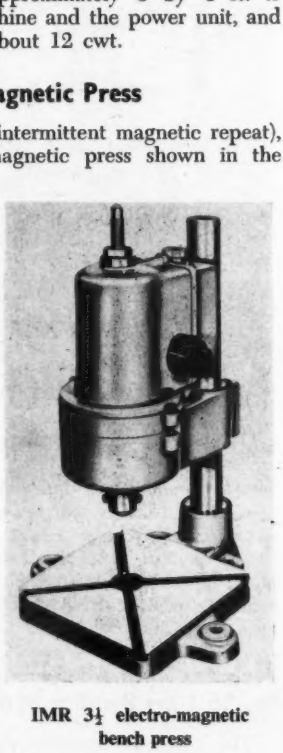
Pressure oil is supplied by a 3-h.p. motor-driven pump, which is mounted in a self-contained power unit seen at the rear, and the steplessly-variable broaching speeds obtainable range from 5 to 15 ft. per min. This unit also incorporates a coolant pump, and the fluid is drawn from a tank housed in the fabricated steel base of the machine. The working area of the platen is 18 in. square, and a central hole which measures 5 in. diameter is provided.

Floor space of approximately 3 by 4 ft. is occupied by the machine and the power unit, and the total weight is about 12 cwt.

Lapointe S.P.D. 7/16 vertical pull broaching machine. A maximum pull of 7,000 lb. can be exerted on a 21-in. long broach

IMR 3½ Electro-magnetic Press

Designated IMR (intermittent magnetic repeat), the 3½-ton electro-magnetic press shown in the figure, which is marketed in this country by The H. G. Stevens Co., Ltd., 16 Coverdale Road, London, N.W.2, is intended for light-duty work such as riveting, blanking, forming, and cutting.



IMR 3½ electro-magnetic bench press

Punches weighing up to 3 lb. can be attached to the nose of the ram, which is operated by a solenoid housed within the self-contained pressing head. Power for this solenoid is taken from an external rectifier, the d.c. output of which is at 170 volts, and a screw mounted co-axially with the ram provides for adjusting the force of the blow from 650 to 7,500 lb. The unit can be set for operation either continuously, at rates which can be varied from approximately 20 to 200 strokes per min., or for single cycle, and it may be controlled by single or duplicated push-button, a pedal-actuated switch, or by means of a limit switch.

The head is normally supplied with a bench-mounted stand, as here shown, and it can be adjusted on the cylindrical column to provide a maximum daylight of 10½ in. over the 10-in. square work-table. Alternatively, it is available separately, for incorporation in special-purpose equipment, and can be mounted to give a working stroke in any direction, including vertically upwards.

Device for Cutting Strips of Adhesive Tape

In connection with the assembly of domestic radio sets at Corran Works, Ltd., Larne, Northern Ireland, large numbers of pre-cut lengths of pressure-sensitive adhesive tape are required. To facilitate cutting the tape into strips of the required lengths, the simple device shown in the accompanying figure was constructed. A plain spindle is mounted in bearings in two brackets, as at *A*, and can be turned freely by means of a cranked handle at one end. Secured to the spindle there are two sheet steel discs, on the inside faces of which are secured a number of standard Terry spring clips.

These clips are employed to hold ¼-in. diameter wooden dowel rods, and since the mouths of the clips are facing radially outwards the rods can be pushed into place from the outside. The free end from a reel of adhesive tape is attached securely to one of the rods and the complete unit is then rotated by the handle while the tape is unrolled and spirally wound on to the rods. When the full length of the rods has been covered in this manner, the tape is severed from the reel. Finally, a sharp knife or razor blade is used to cut the tape transversely, between the dowel rods, to provide a large number of individual strips of approximately equal length.

The strips are left in position on the rods and are removed by the operator, as required. Alternatively, the rods can be removed from the clips and distributed to operators on the assembly benches, who return them when all the strips have been used. If longer strips are required, alternate dowel rods are omitted.

With this arrangement pressure-sensitive adhesive tape is rapidly cut into short lengths, for use in domestic radio assembly work

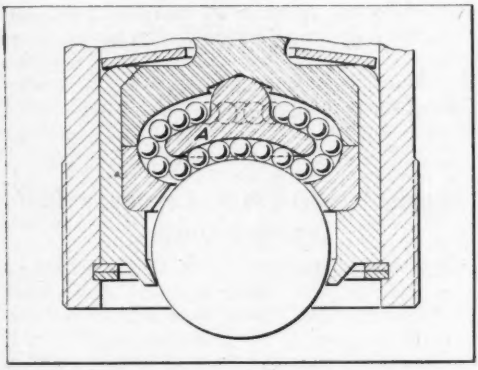
Autoset Omni-Track Conveyor Ball Transfer Units

One of the latest designs of Omni-Track conveyor ball transfer units produced by Autoset (Productions), Ltd., 76-82 Stour Street, Birmingham, 18, is shown in the figure on page 34. It will be noted that, as compared with the earlier type (see MACHINERY, 93/312—6/8/58), the concave/convex member *A*, which serves to channel the re-circulating support balls, has been modified to incorporate a part-spherical projection. This projection seats in a conical recess, and the member *A* is thus permitted to "roll" through a few degrees in all directions.

Consequently, the ¾-in. diameter load-carrying ball can also move angularly within the limits permitted by the shroud ring which surrounds it. As a result of contact with this ring, ingress of dirt and foreign matter to the bearing balls is largely prevented in most applications. At present, this new type of unit is available only in a light-duty form with a dynamic capacity of 75 lb.

With another new design introduced by the company, a pre-load of 75 lb. is applied to the housing for the load-carrying ball and the support balls, by a stack of Belleville washers. Omni-Track units of this type are particularly intended for incorporation in the work-tables of guillotines, to permit heavy steel plates to be readily moved in any direction. Since the force applied to the work when cutting is being carried out exceeds the pre-load, the load-carrying ball in each unit is moved downwards, against the action of the Belleville washers, with the result that the plate is held in close contact with the top surface of the table.

With a third type of Omni-Track unit, the housing for the load-carrying ball and the support balls is mounted in a 4-in. diameter body, which has a 3⅝-in. diameter by 1 ⅛-in. deep bore at the lower end. A helical compression spring, or a rubber sleeve,



Sectional view of one of the latest Autoset Omni-Track conveyor ball transfer units

may be accommodated in the annular recess between the housing and the bore in the body, to provide a pre-load or to absorb a shock when the unit is in service.

Omni-Track units are made in a variety of sizes with capacities from 75 lb. to 5 tons each, and are fitted with load-carrying balls from ½ to 2 in. diameter. An advantage claimed for the units, if used instead of castors, is that they have no trail, with the result that the stress in any chassis to which they are fitted is reduced. It is stated that the starting effort required is approximately 3 per cent of the load when rolling over mild steel, and 0·3 per cent when rolling over hardened steel.

Rust-Oleum Rust-inhibiting Protective Coatings

The range of coatings developed by the Rust-Oleum Corp., Evanston, Ill., U.S.A., includes the No. 769 damp-proof red primer, which incorporates rust-inhibiting pigment and a specially-processed fish oil vehicle. This primer is intended for application to work which is moderately or heavily rusted, and it is claimed that owing to the low surface tension, the vehicle thoroughly wets the porous corroded layer and penetrates to the metal, to displace entrapped air and moisture. In this way, further rusting is prevented. Preparation of the work, which should be free from oil or grease, is carried out by wire brushing or chipping, to remove mill scale, loose rust particles or previously-applied paint.

Outdoor exposure for periods up to 1 year, without a finishing coat, is not detrimental, and the paint resists the effects of temperatures up to 250 deg. F., also moderate fumes, mild acids and brine, for example. It contains no lead, and coated parts may thus be welded without the liberation of toxic fumes. Application may be by brush, roller, spraying, or dipping, and the coat usually dries sufficiently to permit handling and re-coating in 12 to 18 and 24 hours, respectively. One coat, followed by a finishing coat, is normally adequate, but for maximum protection, it is recommended that an intermediate film be applied of either of two coatings, of different colours, which are intended primarily for use on surfaces that are only slightly rusted, or parts that are new or have been sand-blasted. The characteristics of the latter coatings, are broadly similar to those of the former, although exposure can be withstood for only 9 months. Alternatively, there is a type which dries sufficiently to touch and handle in ½ and 1 to 2 hr., respectively.

Fish-oil-based finishing coating is available in a range of 67 colours, many of which match those used by the principal American builders of agricultural machinery and contractors plant, and the effects of temperatures up to 212, 400, and 500 deg. F. are resisted by the light- and medium-coloured, the dark-coloured, and the aluminium-pigmented coatings, respectively. They can also be applied to wood, brick, and masonry.

In addition, the range includes a number of complete coating systems, for specific purposes, and reference may be made to heat resistant coatings, for use at temperatures from 212 to 500 and 500 to 1,200 deg. F., water resistant coatings suitable for application to metal surfaces which are immersed in fresh water or are exposed to considerable moisture, and coatings that dry to permit handling in approximately 1 hr. Heavy-duty, epoxy-type, chemical-resistant coatings, which can be applied to rusted or bare steel, also un-painted concrete, are resistant to most acids and alkalis, also hydraulic fluids and machining coolants. Temperatures up to 300 deg. F. can be withstood, although the life at elevated temperatures is somewhat reduced. Coatings are also available for the protection of concrete and wooden floors which have been previously painted, and there is a range of coatings for marine applications.

Rust-Oleum coatings for sale in Europe are made in Holland, and are stocked in this country by Stedall & Co., Ltd., 192 Pentonville Road, London, N.1.

ELECTRIC IRONS produced during January and February of this year reached a total of 327,000, representing a value of £495,000. Irons exported during these months were valued at £129,200.

Hungarian Machine Tools at the Leipzig Fair

By R. E. GREEN, Associate Editor

SOME 20 MACHINE TOOLS and a range of balancing machines and other equipment were shown in the Hungarian pavilion at the Leipzig Spring Fair this year, and the general view in the heading illustration shows part of the area devoted to these exhibits. There were several new designs, including a centreless grinder and a programme-controlled turret lathe on which feed and speed rates can be set by the insertion of plugs through holes in punched cards, or by means of telephone-type dial switches. Other machines shown included radial drills, milling, grinding and drilling machines, lathes, and spark erosion units, several of which incorporated improvements in design.

CENTRELESS GRINDING MACHINE

The type KCH 63 centreless grinding machine, shown in Fig. 1, is built by the Budapest Machine Tool Works, and has a capacity for workpieces from 0·118 to 2·5 in. diameter, and lengths up to 4·72 for plunge- and 5·9 in. for through-feed operations. A grinding wheel of 13·78 in. diameter and 4·9 in. wide is mounted on a spindle which runs in plain bearings in the housing at the left, secured to the base casting. This spindle is driven, by a 9-h.p. motor, at a speed of 1,640 r.p.m., which corresponds to a peripheral speed of 5,900 ft. per min. with a new wheel.

A control wheel of 9·8 in. diameter by 4·9 in. wide is employed, and the spindle is carried in plain bearings on a double slide at the right, and is driven through change gears which give a choice of speeds from 100 to 300 r.p.m. Nine speeds are obtained by changing the gears, and the highest speed, which is employed for honing operations, is selected by a lever. The spindle is driven by a motor of 0·6/1 h.p., mounted on the slide, and the latter can be adjusted to tilt the wheel axis to a maximum angle of 5 deg.

The lower slide is moved hydraulically for the grinding operation, and the upper slide, carrying the control wheel spindle, can be adjusted relative to the lower member by means of a screw. This screw is turned for coarse adjustment by means of a large hand-wheel at the right, and the nut is turned, through a worm drive, by the smaller hand-wheel on the side of the wheel housing, for fine setting. A vernier scale on this small hand-wheel facilities accurate adjustment. All the wheel

Fig. 1. This type KCH 63 centreless grinding machine, built by the Budapest Machine Tool Works, has a capacity for workpieces from 0·118 to 2·5 in. diameter, and lengths of 4·72 and 5·9 in. for plunge- and through-feed grinding

spindle bearings and guide-ways are pressure lubricated, and there is a pressure switch in the supply line which completes the circuit to the main driving motor.

Guide rails can be supplied for plunge-cut or through-feed grinding operations, and the equipment for plunge-grinding incorporates a knock-out mechanism to eject the part at the end of the cycle. For through-feed grinding, the rail has spring-loaded guides which can be adjusted to suit the work diameter. Profile or parallel forms can be dressed on either wheel by means of hydraulically-operated units, supplied by the pump for the control wheel slide, which is powered by a motor of 1 h.p. A coolant supply unit is also available, with a tank-mounted pump which has a delivery of about 14 gal. per min.

The spindle, which has a bore diameter of 0·98 in., is fitted with a 3-jaw chuck, and parts up to 7·8 in. diameter can be swung over the bed, and up to 3·14 in. over the plunge-forming cross-slide. Between the end of the spindle and the turret face, the maximum distance is 7·5 in., and the turret has a stroke of 3·9 in.

Driven by a motor of 2·25 h.p., through a steplessly-variable unit, the spindle runs in precision roller bearings at speeds from 60 to 3,150 r.p.m. Changes are made by means of a lever, and the speed selected is shown on a large dial at the front of the base. A thread-chasing attachment is fitted at the rear of the headstock. A full range of accessories, including feed units and coolant supply equipment with motor driven pump, is available.

SMALL TURRET LATHE

Built by the Kobanyai Machine Tool Factory, Budapest, the type RMT 16 turret lathe, shown in Fig. 2, is intended for the production of small watch, clock and instrument parts, and has a capacity for round bar up to 0·63 in. diameter.

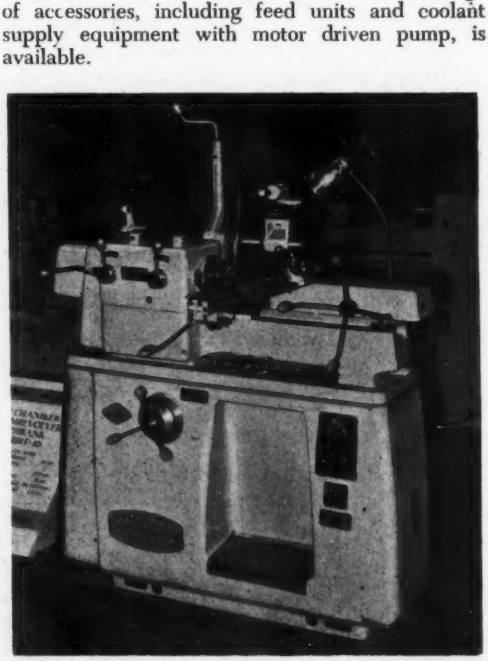


Fig. 2. Intended for the batch production of small components, for example, for clocks and instruments, this type RMT 16 turret lathe is built by the Kobanyai Machine Tool Factory, Budapest, and has a capacity for bar up to 0·63 in. diameter

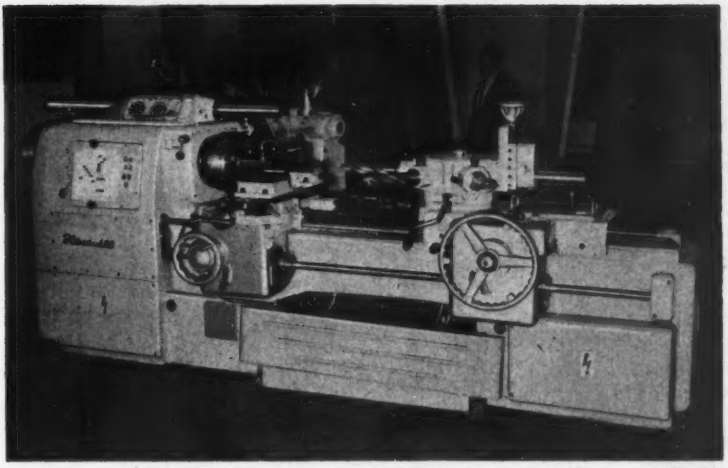


Fig. 3. Built at the Machine Tool and Metal Products Factory, Budapest, this type RT 80 P turret lathe, which will swing 21·6 and 10·2 in. over the bed and cross-slide, is equipped for programme-control of speeds and feeds

PROGRAMME-CONTROLLED TURRET LATHE

Known as the Flexaut 80, the type RT 80 P turret lathe, shown in Fig. 3, incorporates equipment, designed by the Hungarian Institute for Machine Tool Development, for the pre-selection of spindle speeds and feed rates by the insertion of plugs into sockets through holes in a punched card. Built at the Machine Tool and Metal Products factory, Budapest, the machine has a swing capacity of 21·6 and 10·2 in. diameter over the bed and the cross-slide respectively, and the maximum distance between the chuck and turret faces is 49 in. Bar material up to 3·15 in. diameter can be handled.

There are 12 spindle speeds in geometrical progression—with a ratio of 1·4 to 1—from 28 to 1,250 r.p.m. A higher speed range of 35 to 1,600 r.p.m. can be provided if desired. The drive to the spindle is taken from a motor of 18·7 h.p., through V-belts, and speed changes are made by a total of seven electro-magnetic clutches in the headstock. A single magnetic clutch serves to brake the spindle when required, and the remaining shafts run freely until clutches are engaged to select the next spindle speed to be used.

A range of 8 feed rates, from 0·0049 to 0·055 in. per spindle rev., is provided by the feed gearbox, which incorporates six magnetic clutches, and each rate can be halved or doubled by means of levers on the cross- and turret slides. Thus, a fine feed can be employed for finish turning, in conjunction with a coarser feed for reaming from the turret, for instance. When the speed and feed cycle are controlled by punched card, and feed rates are required which cannot be obtained automatically, the feed-rate change levers are moved manually, and electrical

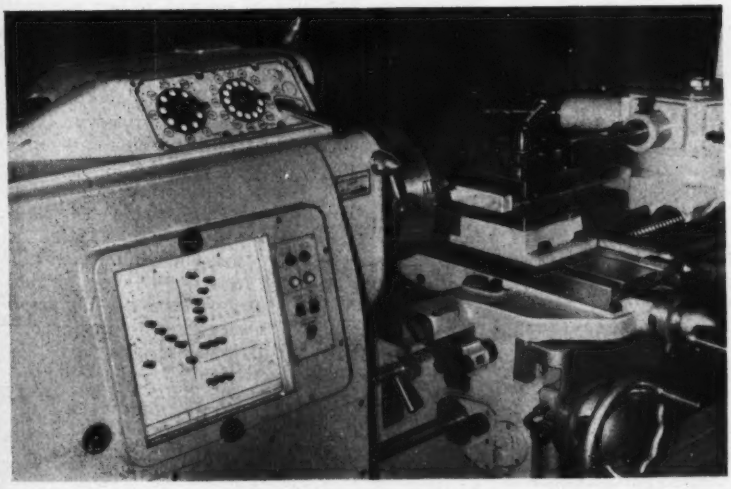


Fig. 4. Close-up view of the programme control equipment, developed by the Hungarian Institute for Machine Tool Development, fitted to the lathe in Fig. 3, and the telephone-type switches for direct selection of speeds and feeds

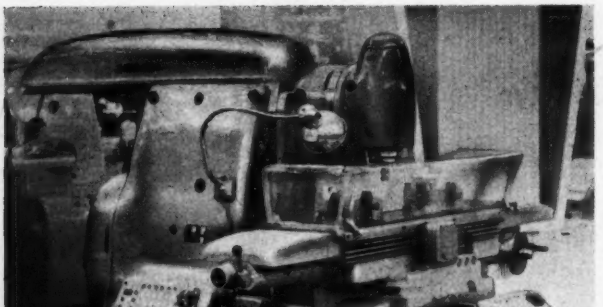


Fig. 5. The type U 320 universal milling machine is one of a range made by the Csepel Machine Tool Works, Budapest. For speed and feed changing sliding gears are moved hydraulically

switches are thus operated to complete circuits and enable machining to proceed. A lamp is illuminated to indicate to the operator the need for engaging the higher or lower feed rate at the appropriate time.

PROGRAMME-CONTROL EQUIPMENT

A close-up view showing the panel into which the punched card is inserted on the headstock of the machine is given in Fig. 4. There are six vertical rows of sockets at the left, each with 12 holes, for the selection of a spindle speed to be used with each turret face. At the right, the card has three areas of which the upper has six horizontal rows of eight holes, for the feed rates. Beneath this area there are two others, each containing three rows of eight holes into which plugs can be inserted to determine whether the low, basic or high feed rates are to be employed for the cross- and turret slides respectively.

To the right of the punched card unit is the panel containing the lamps mentioned above, also switches for the selection of manual or punched card control. Under manual control the machine may be employed for the production of small batches of parts, and the desired speed and feed rates are then obtained merely by dialling on the telephone type switches above. Each hole of these dials is marked with a speed or feed rate, and turning a dial has the effect of setting relays in the control circuits to the magnetic clutches. When the spindle is next stopped, these clutches are automatically energized, and the required speeds and feeds are brought into use automatically when the spindle is restarted.

Power for indexing the turret is provided by a motor of 1·75 h.p., and it can be turned through one or more stations when at any position along the ways. Unclamping of the turret and indexing are controlled by a single lever, and the clamp is automatically re-applied when the lever is returned to its original position. As the turret turns, it rotates a drum with six stops which operate switches connected to the punch card panel, to change the settings of the relays controlling the speed and feed clutches. When the spindle is subsequently re-started, the machine operates at the new rates determined by the plugs in the card. The turret-indexing motor also provides for rapid traverse of the turret slide at 25 ft. per min.

MILLING MACHINES

A similar system, for the programme control of the table movements, is employed on the 320 series of horizontal and vertical milling machines built by the Csepel Machine Tool Works, Budapest. Brief details of this range of machines were given in MACHINERY, 95/43—8/7/59 and 96/1121—18/5/60, and it may be recalled that the table size is 49 by 12·6 in. A general view of the type U 320 universal machine, shown at Leipzig, is given in Fig. 5, and it is equipped with a main motor of 9·3 h.p., which drives the spindle through a hydraulically-operated gearbox giving 20 speeds from 19 to 1,500 r.p.m.

Spindle speed changes are made either manually, by turning a dial at the front of the knee, or automatically during the machine cycle by means of electrical equipment incorporating a punched card control panel housed in a separate cabinet. The speed dial turns a selector switch and is operative only when the machine is stopped. When the dial is turned, the switch is set to energize solenoid valves for controlling the direction of the oil supply to hydraulic cylinders which move gear

selector forks in the gearbox. The cylinders are supplied with pressure oil by a pump which can be driven in either direction, and when a spindle speed change is made, the pump runs left-handed.

Oil is then delivered to the appropriate cylinders in which pressure is maintained for a period of 6 sec., and at the same time the main drive motor is momentarily energized to turn the gears to ensure easy engagement. After this 6-sec. period, the pump motor is automatically reversed, and pressure oil is then supplied through alternative passages to lock the gear selector forks in position and to lubricate the machine.

The programme control equipment housed in the separate cabinet provides for the engagement of any two spindle speeds during a particular cycle. There are two selection dials in the cabinet, which are set to the required spindle speeds, and when instructions are received from the punched card panel for the speed to be changed, the machine is first stopped. A circuit is then completed, through one of the switches turned by the dials, to the solenoids controlling the particular gear selector forks in the gearbox and the required spindle speed is engaged. The machine is then re-started automatically and the cycle proceeds.

Feeds to the table in the longitudinal and transverse directions range from 0·47 to 31·5 in. per min., and to the knee, vertically, from 0·24 to 15·8 in. per min., in 24 steps. Drive from the main motor is transmitted to an auxiliary gearbox housed in the machine base, and this gearbox is of similar design to that for the spindle speeds. Feed rates are selected by a second dial on the knee, and there is provision for the use of any two feeds during any programmed cycle.

From the auxiliary gearbox, drive is transmitted through a double bevel gear unit to the mechanisms for the three directions of table travel. The transmission to each slide-driving mechanism incorporates three remote-controlled, electromagnetic, plate-type clutches, two of which provide for forward and reverse motion. The third clutch is employed to give rapid approach, machining feed, and slow movement for accurate stopping of the particular slide. These clutches may be operated by means of stops on the machine slides, through multi-contact switch boxes, such as that seen beneath the saddle in the close-up view in Fig. 6, or they may be controlled by the punched card unit.

The stops on the machine slides are so designed that they will operate a switch and engage the slow-motion clutch when the slide is within 0·04 to 0·08 in. of the position at which it is required to stop. Movement then continues at the slow rate of 0·39 in. per min. until a second switch is operated to disengage the clutch. The table is thus stopped within a few thousandths of an inch of the pre-set position.

When the machine is operated under programme control, an electrical socket panel with twenty rows of sockets is employed, and a similar number of changes of direction of the various slides can be obtained. Each row has 16 sockets in which plugs are inserted in accordance with the holes punched in the programming card, to control such machine functions as spindle starting and stopping, engagement and disengagement of rapid approach, cutting feed and slow traverse, selection of one of two spindle speeds and feed rates, and

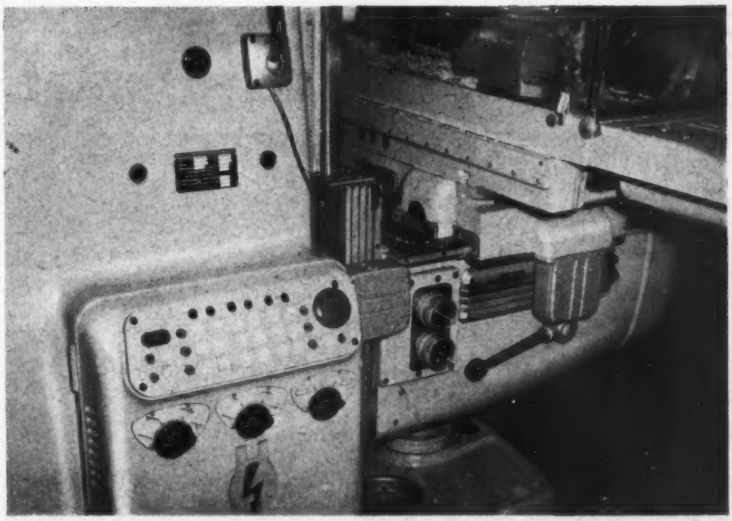


Fig. 6. Close-up view of the U 320 milling machine showing the stops whereby movements of the slides are set, and the side push-button station for manually-controlled movement of the slides

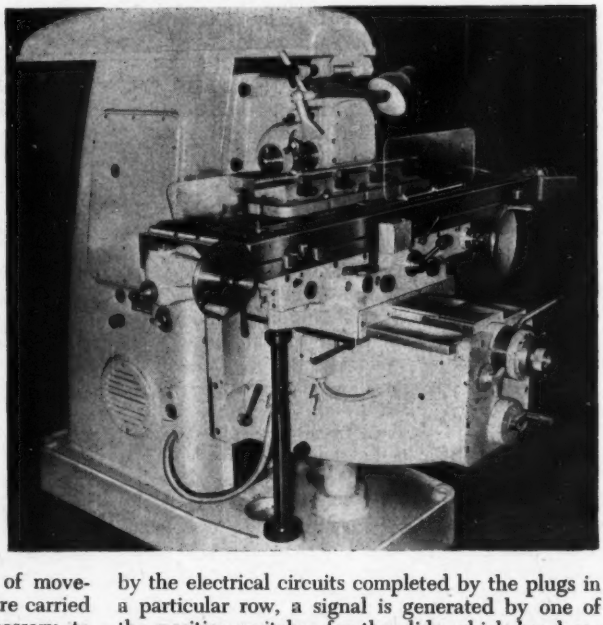


Fig. 7. A rack-milling attachment was fitted to this type UF 222 universal milling machine, which is also built by the Csepel factory. A new feature is the provision of an anti-backlash arrangement to permit climb milling

the starting of a timing relay which controls the period for which the slow traverse rate is to operate at the end of each slide movement.

The relay has a scale which is graduated in mm. values in terms of the slow traverse rate of 10 mm. (0·39 in.) per min., and it serves to disengage the slow traverse clutch. If it is necessary to stop a slide at a certain position within accurate limits, the relay is set to allow the slide movement to be reduced to the slow rate, and to provide for a short period of movement at that rate. Trials of the setting are carried out, and adjustments are made if necessary to ensure that the slide will be stopped automatically, during the programmed cycle, at the desired position, within the required limits. The sequence of operations of the machine is controlled by means of a telephone-type line-selector stepping switch, whereby one row of sockets in the plug panel is brought into operation at a time. At the end of the series of movements initiated by the electrical circuits completed by the plugs in a particular row, a signal is generated by one of the position switches for the slide which has been moved, to index the selector switch and bring the next row of sockets into use.

Several other milling machines made by the Csepel works were shown at the Fair, including examples from the MF 250 range which are available in vertical and horizontal forms and have tables measuring 9·8 by 39·4 in. Power feed can be applied to the table in all three directions, and the 18 spindle speeds range from 45 to 2,250 r.p.m. The current version of the universal machine from the UF 222 range, developed from the type UF 22,

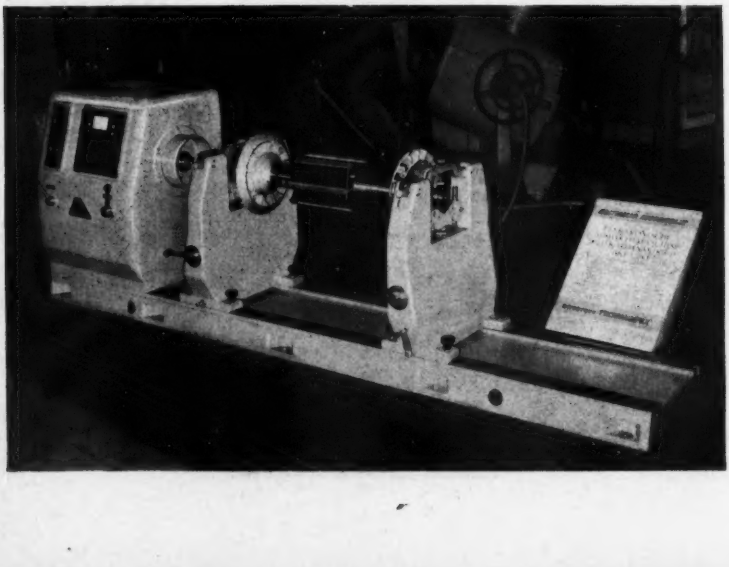


Fig. 8. The largest in a range built by the Institute for Machine Tool Development, Budapest, this type BKE 320 machine is designed for dynamic balancing of workpieces with weights from 22 to 705 lb.

described in MACHINERY, 93/214—23/7/58, was also shown, and was fitted with a rack cutting attachment, as seen in Fig. 7. This machine has a table measuring 15·75 by 65 in., and there are 20 spindle speeds ranging from 19 to 1,500 r.p.m. The 18 feed rates for the table range from 0·38 to 19·68 in. per min., and the screw for longitudinal movement now has an anti-backlash arrangement.

DYNAMIC BALANCING MACHINE

Equipment demonstrated also included improved versions of the Duromatic hard-facing unit (MACHINERY, 96/154—20/1/60), and the Erosimat C spark-erosion machine (MACHINERY, 93/217—23/7/58). The complete range of electronic balancing machines made by the Institute for Machine Tool Development, Budapest, which includes equipment for workpieces weighing from a few ounces up to 705 lb., was also shown. The largest machine in the range—the type BKE 320—which has a capacity for workpieces from 22 to 705 lb. in weight, is shown in Fig. 8, and will accommodate components or assemblies of diameters up to 49 in.

It is made with two bed lengths, to take parts from 9·9 to 63, and from 9·9 to 78 in. long, and the right-hand support is adjustable by rack and pinion. Shafts of diameters from 0·315 to 4·9 in. can be accommodated in the supports, and they rest on spring-mounted bearing carriers to which dynamic sensing heads are coupled. The components are driven at a speed which may be varied between 500 and 1,000 r.p.m., through a universally-jointed shaft, from a motor housed in the base at the left, and an electrical signal proportional to the extent of the unbalance is transmitted through an amplifier to an instrument on the panel. This instrument may be calibrated in microns, in cm.-gm., or in terms of the required depth for correction by drilling.

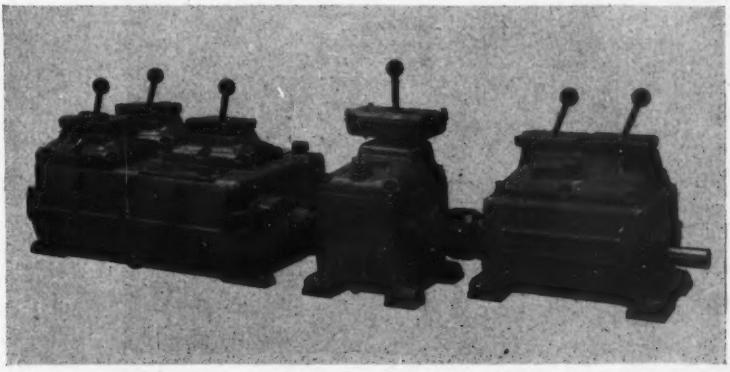
The angular position of the unbalance is determined by means of a servo-motor, and the machine is fitted with an electrical brake mechanism which quickly stops the rotation of the work after measurements have been made. Safety mechanisms are fitted to the supports to prevent accidents when balancing very heavy workpieces, and the machine is stated to be particularly simple to operate.

Matterson Arithmic Multi-speed Gearbox

Matterson, Ltd., Shawclough, P.O. Box 31, Rochdale, Lancs., have recently introduced the Arithmic gearbox, which can be arranged for either 21 or 24 output speeds, with overall ratios of 2:1 and 24:1, respectively, in arithmetic progression. The nominal input speed is 1,000 r.p.m., and the sizes available at present are rated at 10 and 30 h.p.

Housed within a cast iron casing, the unit incorporates machine-cut gears, made from alloy steel and heat treated. The shafts are mounted in either ball or roller bearings, and those which carry sliding gears are splined. Bronze gear-selector fingers are employed, and there is a mechanical interlocking system.

Additional multi-speed gearboxes are available for use with these units, to enable the speed ranges to be extended, and with one such combination, a total of 84 speeds with an overall ratio of 8:1 can be obtained. Reversing gearboxes, with shaft heights corresponding to those of the Arithmic units, are also available, and can be supplied with reduction ratios up to 3:1. A typical combination of additional units with an Arithmic gearbox is seen in the accompanying illustration.



A range of output speeds in arithmetic progression is provided by the Matterson Arithmic gearbox, here shown connected with other gear units

The Work of P.E.R.A.

The 16th annual report of the Council of the Production Engineering Research Association, Melton Mowbray, Leics., for the year ended December 31, 1960, was presented at the recent Annual General Meeting. During the period under review, the number of member firms increased by 58 to a total of 841. (At the time of presenting the report, the number of member firms was 900.)

There was a substantial increase in the number—and a widening of the scope—of sponsored research and advisory programmes undertaken on behalf of members during the year. In all, 226 sponsored projects were completed, and work was started on 218 new programmes, covering various aspects of design, development, and production of a wide range of items. The projects which have been undertaken have included, for example, the measurement and analysis of sources of vibration in machine tools and production equipment; re-design of products to facilitate production; development of tooling for cold extrusion, and finish blanking and piercing; installation of planned maintenance schemes; development of handling equipment and complete systems for automated production of various components; testing of cutting fluids; organizational development; factory layouts; general efficiency surveys; testing of presses; production control procedures; method study; and costing and budgetary control.

It is reported that considerable economies have been made by member firms as a result of investigations which have been carried out by the Association on their behalf. For instance, it is stated that the adoption of recommendations made by the Association following a detailed study of tooling, plant, and product design at the works of one company, resulted in a net saving of £20,000 on machining processes alone in the first year. In another instance, the assistance of the Association was sought with the object of reducing the cost of producing transmission units. Following investigation of various techniques for the production of these items, cold extrusion was adopted, and the procedure and tooling required for the operation were developed by P.E.R.A. As a result, a saving of £75,000 per annum has been obtained on production costs, and the amount of metal required for making the parts has been reduced by 50 per cent. At the works of a third member company, P.E.R.A. finish blanking techniques have been applied to replace methods formerly employed for the production of certain motor car components. As a consequence, the number of operations required for the production of the components has been reduced from eleven to one, and the manufacturing cost is only 10 per cent of the previous figure.

Fig. 1. This remotely-controlled copying lathe has been designed and built by P.E.R.A. for turning components in irradiated uranium

A special copying lathe, which, it is anticipated, will reduce the time required for turning certain irradiated uranium components from one day to 30 min., has been designed and built by the Association under another sponsored development programme. Shown in the background in Fig. 1, the lathe is at present undergoing simulation trials, prior to tests involving the machining of parts in irradiated uranium. Remote control of the various motions is provided electrically by push-buttons, switches and knobs mounted on the console seen in the foreground. The operator is shown adjusting the handwheel for controlling the cross-slide.

The cutting area is totally enclosed to prevent escape of contaminated

swarf and coolant, and when the lathe is brought into service, it will be housed separately from the control unit in a "cell." The lathe and the work and tool-holding arrangements are of exceptionally rigid construction, and special provision has been made for controlling the working temperature to ensure that the close dimensional tolerances and high surface finish specified for the workpieces can be maintained. A 2-head air gauging system is provided, and the indicator unit for this equipment may be seen at the right-hand end of the lathe bed. Since no reliable data were available concerning optimum cutting conditions, types of cutting tools and cutting fluids for turning irradiated uranium, investigations have been carried out by the Association in order to determine the most suitable machining cycle.

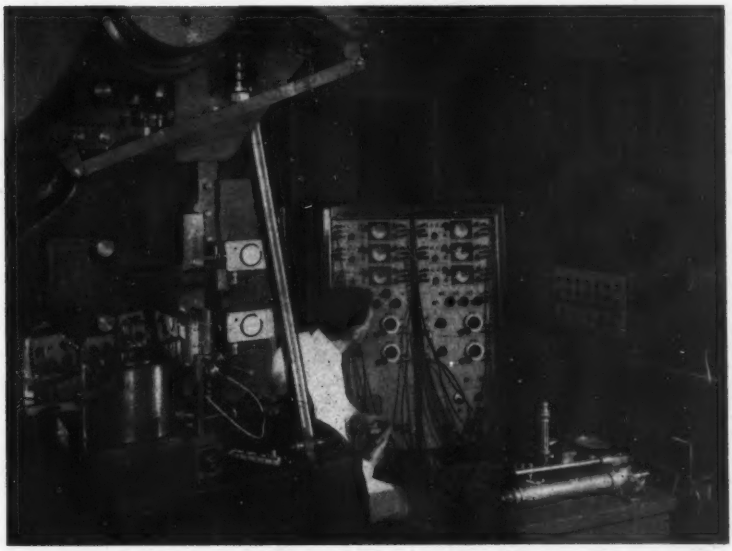


Fig. 2. Equipment is here shown set up at the P.E.R.A. laboratories for investigating static and dynamic deflections of an open-fronted power press and for observing variations in flywheel energy during forming operations

In addition to sponsored research and advisory projects, a total of 34 general investigations was carried out by the Association during the year, and 13 new reports were issued. This work included investigations into the performances of several makes of cylindrical grinders; types of surfaces, material, and lubricants for machine tool slideways; vibration absorbing arrangements for boring bars; machining properties of carbon and free cutting steels; impact (cold) extrusion of low carbon steels; cutting fluids; work handling and positioning equipment; effects of point thinning on drill life; blankholder loads and viscosity of lubricants for drawing mild steel parts; thread rolling; vibration characteristics of machine tool structures; the effects of various factors on the performance of ceramic cutting tools; boring and trepanning; the economics and performance of numerical control equipment for co-ordinate setting; and the performance of power presses. Fig. 2 shows equipment set up for investigating static and dynamic deflections of an open-fronted power press, and for observing variations in flywheel energy during forming operations. In order to take full advantage of the P.E.R.A. finish blanking techniques, for the production of metal pressings, it is important that deflection of the punch and die caused by distortion of the press frame should be held to a minimum value.

Sir William Stanier, F.R.S., was re-elected President of P.E.R.A., and Sir Basil Tangye (Tangyes, Ltd.) as Chairman of the Council, and Mr. A. L. Stuchbery (Metal Box Co., Ltd.) and Mr. G. R. Pryor (Edward Pryor & Son, Ltd.) as Vice-Chairmen. Mr. C. F. Barnard (Mirlees, Bickerton & Day, Ltd.), C. G. H. Richardson (Ransome & Marles Bearing Co., Ltd.), Mr. J. R. Widdowson (Samuel Fox & Co., Ltd.) and Mr. A. J. Worster (The Rover Co., Ltd.) were newly elected as Council members, and the following retiring members were re-elected: Mr. H. Gardner (Glenfield & Kennedy Holdings, Ltd.), Mr. G. L. Hack (Bristol Siddeley Engines, Ltd.), Mr. A. Siddall [Joseph Lucas (Electrical), Ltd.], Mr. J. B. Stevenson (Electrical & Musical Industries, Ltd.), and Mr. F. K. Lord (Standard Triumph International, Ltd.).

PRODUCTION OF DRY SHAVERS in the U.K. during February of this year was 32,000, with a total value of £112,000. For the year 1960, the average monthly output was 82,200 units, valued at £297,700.

NEWS OF THE INDUSTRY

The Midlands

HERBERT TERRY & SONS, LTD., Redditch, Worcs., are busy in all departments on the production of pressings, coil springs, flat springs, and Anglepoise lamps. The new finishing shop and warehouse are now in use and provide improved facilities for the heat treatment and subsequent handling and packaging of the company's spring parts, which vary considerably in size and shape.

Two shaker hearth furnaces, one rated at 50-kW. and the other at 20-kW., have been supplied by Efco Furnaces, Ltd., Weybridge, Surrey, and each is arranged for closed quenching of the work-pieces. Controlled atmosphere for each furnace is supplied by an endothermic generator operating on town gas, and a meter by Alnor is employed to check that the dewpoint is maintained at 20-25 deg. F. in the generator. The larger furnace, here illustrated, gives outputs up to 340 lb. per hour, depending on the nature of the work. Quenched springs are removed from the tank by a slat conveyor, seen in the centre of the figure, and discharged into an automatic washing, rinsing, and drying machine supplied by Electro-Chemical Engineering Co., Ltd., Sheerwater Trading Estate, Woking, Surrey.

HYMATIC ENGINEERING CO., LTD., (AUTOMATION DIVISION), Redditch, Worcs., specialize in the design and construction of automatic work handling devices to facilitate the transfer of parts along production lines. A project of this type may require integrated equipment designed to push, pull, lift, lower, turn, or tilt workpieces during manufacture, transfer them to successive work stations, and, in some instances, sort and assemble the finished parts. It is stated that such equipment is being supplied to firms with both small and large productive capacities. In a number of works, the Hymatic system of automation has been applied progressively, for example, where productivity is scheduled to reach specified levels in accordance with a programme of expansion. Extensive machining of parts is not covered by a Hymatic project of this type but provision is sometimes made for minor operations such as hole drilling followed by insertion of split pins.

New heat treatment and washing plant for spring parts at the works of Herbert Terry & Sons, Ltd. The shaker hearth furnace, here shown, is of 50 kW. rating and gives outputs up to 340 lb. per hour

Examples of projects undertaken by the company include the provision of an automatic drum spraying line on which the ends and sides of the drums are spray finished in identical or different colours, as required; a roof-level wheel distribution system for a vehicle assembly line; a complete installation for feeding steel bars to a punching and cropping press; and multi-station equipment for fitting and inflating tubeless tyres in a 10-sec. cycle.

DERITEND PRECISION CASTINGS, LTD., Droitwich, Worcs., are expanding their activities in the field of close tolerance casting, and are organizing their production facilities to provide for increased output of parts in a wide variety of alloys. The company reports a rising demand for precision castings in the Nimocast range of nickel-based alloys and Stellite X 40 hard alloy. Work in progress in the shops includes combustion chamber inserts for high-speed diesel engines.

VILLIERS (TOOL DEVELOPMENTS), LTD., Waddens Brook, Wednesfield, Staffs., inform us that they are still very well placed for orders for unit heads, special-purpose machine tools, and tooling of simplified design which may be produced at low cost. The new drawing office, which will provide design facilities on a much larger scale than were previously available, is nearing completion. In the shops several new machine tools have been installed recently, including a Matrix No. 50 and an S.I.P. Hydroptic 6A jig borer, and the total number of jig boring machines available has thus been increased to nine.

PEAK ENGINEERING CO., LTD., Masons Road, Stratford-on-Avon, Warwickshire, are now working extra shifts to maintain the required output of precision parts for the aircraft, motor vehicle, and other industries. Typical work in progress in the shops includes wheel hubs, flywheel housings, water pump impellers and components for hydraulic equipment. The shops have a total area of approximately 30,000 sq. ft. and are well equipped with modern machine tools among which we may note a Churchill Redman P5 copying lathe, Sykes gear shaping machines, three Société Genevoise jig boring machines, including a Hydroptic type 6, a variety of Herbert capstan lathes, B.S.A. chucking autos, a Precimax fine boring machine, and Delapena honing equipment. A scheme is in operation for the training of apprentices.

PRECISION METAL SPINNINGS, LTD., Masons Road, Stratford-on-Avon, are still very busy with the construction of paraboloid reflectors for microwave applications in this country and overseas. The reflectors are produced by combined spinning and fabrication techniques. Facilities are

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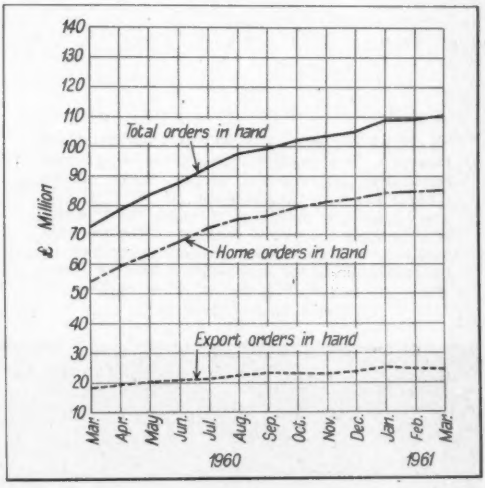
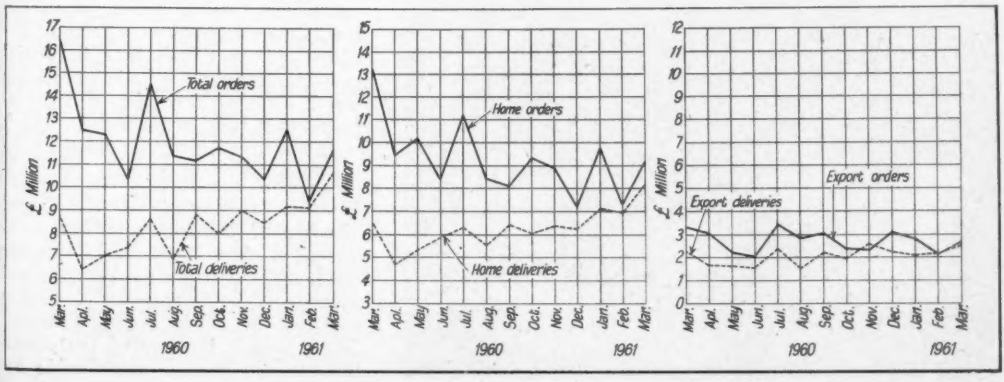

£ Million
Total orders in hand
Home orders in hand
Export orders in hand
Mar. Apr. May Jun. Jul. Aug. Sep. Oct. Nov. Dec. Jan. Feb. Mar.
1960
1961

The accompanying graphs show the values of machine tool orders and deliveries for the period ending March, 1961, also the values of orders in hand



being provided on an increasing scale for the production of aluminium hollow-ware for domestic use and the hotel trade. Delivery of components for the aircraft industry is being maintained at a steady level, and provision is shortly to be made for increasing the output of dairy equipment. The works, which were erected recently, can be extended when required.

F. W. HERRIDGE.

Yorkshire

FRED WHITELEY, LTD., Mount Pellon Works, Halifax, report increasing sales of their sheet metal equipment which includes workshop benches, stores shelving and lockers, and sectional partitioning. Their services as makers of fabricated bases, guards, and trays for the machine tool industry are also in keen request. We are informed that there is an exceptional demand for the Unigraph business chart, particularly from the U.S.A.

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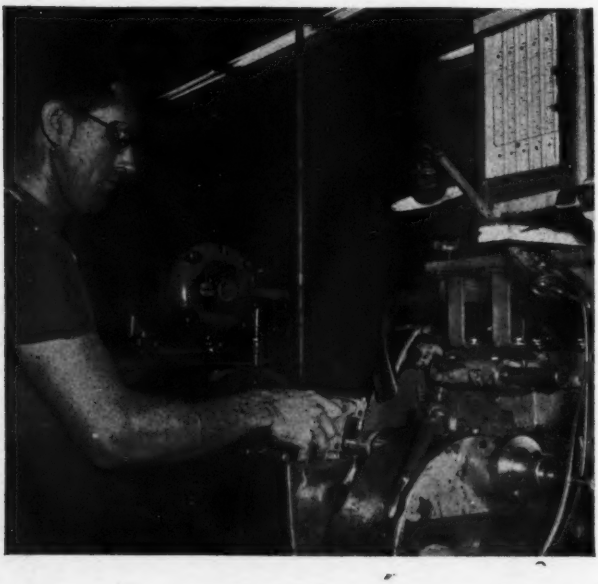
To facilitate grinding work to close limits of accuracy, this Sheffield Precisionaire gauging installation is employed in the works of the Gisholt Machine Co., Madison, 10, Wis., U.S.A. The operator is here seen checking the diameter of a workpiece, while in position on the machine, with the aid of an air snap gauge connected to the indicating unit at the upper right. This particular component is a shaft for the end-drive coupling of a type U balancing machine



This company recently began manufacture of metal skirtings, beads, and picture rails, to B.S.S. 1246/1959, and we are informed that a good volume of orders for these items is now being received from the building industry.

WRIGHT ELECTRIC MOTORS (HALIFAX), LTD., Pellon Lane, Halifax, have an unusually large volume of orders from machine tool builders for their range of Electrosuds coolant pumps. We are informed that orders are also in hand for grinding heads and spindles, motor generator sets, a.c. and d.c. motors for centrifuges, special motors for the textile industry, diesel generating sets, motors for lift and hoist applications, and standard motors of various types and sizes. Electric motors for use with Kopp variator units are also in steady demand.

AJAX MACHINE TOOL CO., LTD., Johnson Street, Pellon Lane, Halifax, report a steady demand for their products which include radial drilling machines up to 8-ft. radius, and a milling machine with a table capacity of 16 in. by 10 in.

Machine tools and equipment at present in production are scheduled mainly for delivery in the United Kingdom, although a proportion is destined for export to various countries.

F. PRATT & CO., LTD., Lister Lane, Halifax, inform us that the growth in demand for their range of work-holding equipment is being well maintained, and that full overtime working is now in operation in all branches of the company to meet home and export orders. This company is to exhibit various representative products at the forthcoming European Machine Tool Exhibition at Brussels.

DARGUE BROS., LTD., South Parade, Halifax, makers of drawing office equipment and supplies, report a constantly increasing demand for their equipment both from industrial users and from technical training colleges. A number of new developments is in hand at present, to which we hope to make further reference in a subsequent issue.

OLDFIELD & SCHOFIELD CO., LTD., Boothtown, Halifax, are busy producing all sizes of standard lathes for the home and export markets. A good volume of export orders is being received for their range of wheel lathes, and it is reported that there has recently been a considerable in-

crease in orders for their range of straightening machines.

GLOBE ENGINEERING CO., LTD., Huddersfield Road, Brighouse, report that their works are fully engaged in the manufacture of electric motors, in an extensive variety of types and sizes. There is a heavy demand for motors of the fabricated body, totally enclosed, shock-proof type.

WOODHOUSE & MITCHELL, Wakefield Road, Brighouse, report a brisk demand, from both home and overseas buyers, for standard milling machines and lathes, copy-milling machines and lathes equipped with copying attachments. Export orders are now in hand for Australia and New Zealand.

J. BLAKEBOROUGH & SONS, LTD., Birds Royd, Brighouse, are actively engaged in the production of valves of all types and sizes. We are informed that a new factory and office block is being built on a 6-acre site adjoining the main works. This new factory will be devoted to the manufacture of diaphragm-controlled valves and pressure regulators, to meet the increasing orders for these units.

JAMES RESIDE, LTD., Brighouse, report that all departments in their group of companies are experiencing a heavy demand for their many and varied products. On account of the increasing volume of orders for mechanical handling plant and equipment, a new company, entitled James Reside (Handling), Ltd., has been formed to manufacture this equipment, and will operate from the Brighouse works.

DENFORD MACHINE TOOL CO., LTD., Victoria Works, Birds Royd, Brighouse, who build the Viceroy range of machine tools and equipment designed for educational purposes in technical schools and colleges, are experiencing a growing volume of orders from authorities both at home and abroad.

An associate company, Denford Small Tools, Ltd., report a heavy demand for their range of tool holders, and it may be mentioned that the U.S.A. is one of the most important export markets for these units. This company, in association with Futurmill Conversions, Ltd., Leeds, has recently formed a new company, under the name of Futurmill-Denford, Ltd., which is to be responsible for the manufacture and development of the Futurmill plano-milling conversion unit.

J. GOULDER & SONS, LTD., Albany Road, Kirkheaton, Nr. Huddersfield, inform us that there has been an increasing call for all the gear testing equipment in their range in recent months. One recent order received is for 32 type S-9-in. gear testing instruments for use in the works of a motor car manufacturing company.

Work at present in progress includes a number of 3V-24-in. vertical lead testing machines, and two 2.H. lead testing machines for export to Japan. Various other machines were seen in production including a number destined for Canada.

Other activities of the company include jig boring and precision machining on a contract basis for the aircraft, motor vehicle, machine tool, and other industries.

HUDDERSFIELD GAUGES, LTD., Waterloo, Huddersfield, report a continuation of the heavy demand for their verniers, slip gauges, micrometers and sine-bars, and we understand that approximately 80 per cent of current production is being exported.

Work is now well advanced on a new factory building which will provide a number of thermostatically controlled clean-air departments for the manufacture of the company's products.

SANDERSON INSTRUMENTS (HUDDERSFIELD), LTD., Wellington Works, Plover Road, Lindley, Nr. Huddersfield, are now in occupation of their new factory which at present covers some 3,000 sq. ft. We are informed that although the call for their range of vernier height and depth gauges and caliper type gauges is steadily increasing, the new factory will enable the company to keep pace with this growing demand.

In addition, the company undertakes the graduating of various machine tool scales and dials to customers' particular requirements, and business in this field is reported to be brisk. Recent additions to plant include a Wanderer vertical milling machine.

RELIANCE GEAR CO., LTD., St. Helens Works, Almondbury, Nr. Huddersfield, state that whereas a good demand is being experienced for their range of worm, spur and helical gear reduction sets, a large increase has been noted in the call for the precision-built, modular, servo-mechanism gearboxes. A number of these units has been undergoing life-testing in the field over the past year, and it is reported that very encouraging results have been obtained. The company, it may be noted, is now supplying Spiroid gears for control mechanisms under licence from Illinois Tool Works, Chicago, U.S.A.

Additional fitting and assembly capacity has recently been provided in the works and new plant installed in the machine shops includes two B.S.A. automatics; a Churchill internal grinding machine; a Sykes 14-in. capacity gear shaving

machine; a 24-in. capacity Orcutt gear grinding machine; a 20-in. involute gear testing machine; a Hardinge H.L.V. precision centre lathe; a Balding vertical milling machine fitted with optical scales; a Blanchard 16-in. surface grinding machine; and a number of capstan lathes.

R. SUTCLIFFE.

Calor Gas (Distributing) Co., Ltd.

The principal activity of Calor Gas (Distributing) Co., Ltd., 178-202 Great Portland Street, London, W.1, is the distribution, on a wide scale, of liquefied petroleum gases supplied under long-term contracts by a number of oil refineries. Propane, which the company delivers primarily to industrial users, is distributed in a liquified state either by road tanker to bulk supply tanks on factory and work sites or in pressurized containers of different sizes from 8½ lb. to 75 lb. capacity. The liquid is colourless and non-poisonous and has a calorific value, when gasified, of 2,500 B.Th.U. per cu. ft., or approximately five times that of town gas.

At the Calor Research and Development Establishment at Addlestone, Surrey, new applications for Calor propane are investigated, and technical advice on the correct use of this gas is given. Much of the increase in the industrial demand for propane is due to the fact that this gas is being increasingly employed as an all-purpose fuel in various works. For example, propane from a bulk storage tank, suitably situated, may be distributed by pipe-line to all parts of a works area and utilized for cutting, brazing, soldering, pre-heating, descaling, welding, and stress relieving; heat treatment, including annealing, normalizing, and hardening, and for controlled atmospheres provided by endothermic and exothermic generators for bright annealing furnaces; die heating for hot pressing operations; core drying and shell mould work; metal spraying; space heating; and as a fuel for stationary and vehicle engines, including those of fork-lift trucks, with the advantage that the exhaust fumes are not toxic.

Of the company's filling depots and maintenance stations, the largest, completed five years ago, is at Millbrook, Southampton, and from this establishment up to 20,000 tons of propane are distributed annually. Storage tanks for customers' use are brought to the Millbrook station, shot-blasted, metal-sprayed, fitted with valves, and pressure-tested. They are then one-third filled, transported to site, and topped up by road tanker when installed. Smaller cylinders are prepared for use and tested in preparation for filling from an electrically-operated dispensing and weighing installation. It is claimed that the volumetric filling system employed is among the fastest and most accurate so far developed.

Reconditioning of cylinders is carried out automatically with equipment supplied by Tilghman's, Ltd., Broadheath, Manchester, Metco, Ltd., Chobham, Woking, Surrey, and Ray-Heet (Process Plant), Ltd., Great Bookham, Surrey. The processing line comprises a shotblasting station with two Wheelabrator 20-h.p., airless, machines, a Metco metal spraying unit, and a Ray-Heet stoving oven, all connected by a conveyor. Shot, or angular grit, discharged at the rate of 1,000 lb. per hour from the Wheelabrator wheels which are driven by two 20-h.p. motors, is collected by bucket elevators and returned continuously to feed-chutes for further use.

A Calor gas cylinder is here being automatically sprayed with a Metco gun to provide a protective zinc coating

Dust is separated from the shot and is delivered to a filter installation outside the building.

The rotating cylinders are then fed slowly through the metal-spraying zone, as shown in the accompanying illustration, where they receive a protective coating of zinc from a Metco spray-gun. By means of trip levers on the conveyor, which are connected to the control valves of the air cylinders shown, forward, reverse and swivelling motions are

imparted to the gun, to follow the contours of the work.

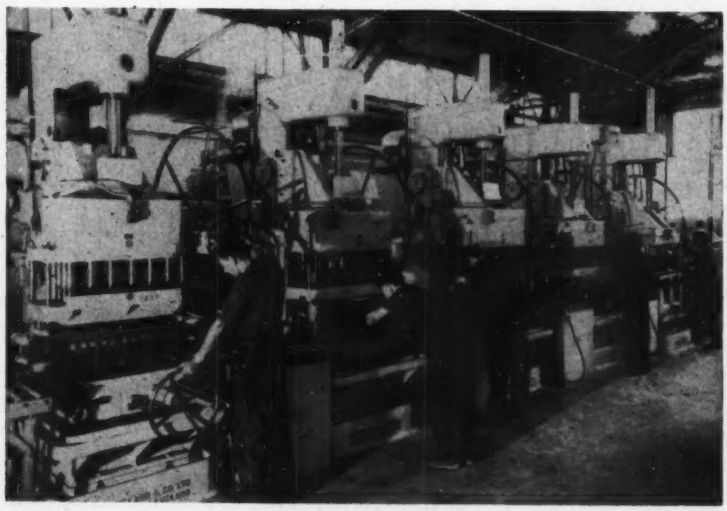
On leaving the metal-spraying station, the cylinders are conveyed to an enclosure wherein the bases are dipped in a paint tank, and the walls are sprayed with paint. The painted surfaces are dried by radiant heat emitted by 40 propane-fired Ray-Heet units, installed in a tunnel 17 ft. 6 in. long. As many as 64 cylinders, each of 32 lb. capacity, may be passed hourly along this reconditioning line.

A subsidiary company, Waller Engineering, Ltd., with a main factory in Harvel, Kent, is shortly to start production of Calor gas flame cutters, blow torches, space heaters, and other appliances in a new works, recently built on a site adjacent to the filling station at Millbrook.

Perkins Engine Production in Brazil

Motores Perkins, S.A., which was formed by F. Perkins, Ltd., Peterborough, completed the first Brazilian-made Perkins engine in November of last year in the 120,000 sq. ft. factory established in Sao Paulo. A 6-cylinder vehicle and a 4-cylinder tractor engine are now in production, and it is planned to achieve an ultimate output of 20,000 engines per year, of various types.

In December last, the first Perkins-engined Ford tractor to be built in Brazil was officially presented to the President, Dr. Juscelino Kubitschek.



Pollard multi-spindle drilling machines installed in the factory of Motores Perkins, S.A., for operations on heads for 6-cylinder engines

The accompanying illustration shows part of the cylinder head line.

Results of 11th F.B.I. Enquiry

In February, the results of an F.B.I. enquiry suggested falling orders and rising stocks, an easier labour position, and less optimism. According to the latest returns submitted to the Federation of British Industries, 21 Tothill Street, London, S.W.1, however, there has since been a revival in new orders (18 per cent up on balance as compared with 5 per cent down last time), a lengthening of order books, and an increase in output (not yet apparent in official figures). Confirmation of the changed situation is given by the fact that shortage of skilled labour is again the main impediment to increased output, whereas in February, orders (or sales), for the first time, had become the major factor.

The latest enquiry also shows that stocks at all levels have again risen—in contract to the expectation that raw material stocks would fall, and that finished goods and work in progress would remain steady.

In February it was pointed out that the balance of firms reporting a rise in costs was the highest since these enquiries began. This time, a further substantial rise in costs is suggested, coupled with a much smaller rise in selling prices and a further lessening of profit margins. The increase in the balance of firms reporting a rise in costs and a fall in margins was greater than expected.

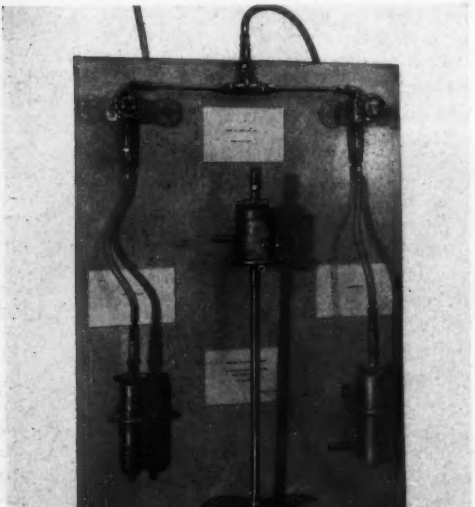
On this occasion a detailed enquiry was made into exports, and answers to questions relating to rates of new orders and deliveries showed a significant improvement for the first time since a year ago. This improvement, however, was less marked than that shown for the home trade. Replies to new questions asked indicated that despite a rise in export orders in hand, delivery dates have been shortening somewhat, and that more orders have been booked at lower prices. This situation is in con-

trast to the reported rise in prices for the home market, and the general rise in unit costs of production. Despite this fall in prices, "the comparative price level is by far the most serious short-term problem facing exporters, delivery dates being of minor importance in comparison.

Silencing of Air Motors

Kodak, Ltd., Wealdstone, Harrow, Middlesex, whose workshops and processing departments are provided with a variety of pneumatic equipment, have devised a method of suppressing noise produced by the exhausts of air motors, two examples being shown in the accompanying illustration. Silencing is effected by surrounding a noisy air motor with glass wool, loosely packed within a cylindrical jacket provided with end caps and an opening to atmosphere which is as far removed from the exhaust ports as possible.

For demonstration purposes, the jacket for the air motor fitted to the 3-bladed agitating propeller has been provided with a rectangular window, through which the packing material may be seen. The single exhaust pipe is on the left of the jacket. The two other exhibits on the display panel are air motors of the type widely employed with a variety of attachments. The example on the left is shown as supplied, whereas an indentical motor on the right is fitted with a silencing jacket. It is claimed that the method of silencing employed, which is the subject of Patent application 15769/61, has little adverse effect on the performance of the air motors.



Examples of air motors fitted with silencing jackets designed by Kodak, Ltd., Harrow, Middlesex

Foundry Exhibition

A 3-day Foundry Exhibition, organized by the Department of Industrial Metallurgy of the University of Birmingham, and held in the Great Hall of the University at Edgbaston, was unusual in that it sought to stimulate appreciation of the nature and scope of modern foundry processes among a wider audience than such exhibitions normally attract. To this end, a considerable area of the display space in the centre of the hall was devoted to art castings, statuary and jewellery, together with decorative but functional articles ranging from door-knockers to fire-screens, while stands around the sides of the hall displayed engineering castings produced by many different techniques in a variety of alloys. A view showing some of the exhibits is given in the accompanying illustration.

Throughout, the aim was to stress the unity of the founder's craft, whether directed to the needs of art or industry, and to show, in some measure, the essentially creative nature of the foundryman's daily work—involving the translation of the original concept of the artist or industrial designer into a form reproducible as a metal casting. Pattern making and moulding by traditional methods were fully represented, and one stand showed the modification of these methods resulting from the recently-developed CO_2 process. A scale model of a modern industrial foundry layout proved of particular interest.

Examples of shell moulds and products cast in them, of precision casting by both the "shell" and "can" methods, and of gravity and pressure die casting were on display, a stand being devoted to each process. The collection and presentation of the material was the work of the appropriate trade associations and of individual companies in the industries concerned, but an overall unity was obtained by the use of a standard type and size of stand for each process.

One of the aims of the organizers of the Exhibition was to attract more recruits to the foundry industry, both from the University and outside. Dr. Kondic, of the University's Department of Industrial Metallurgy, emphasized that there is still a

A view showing some of the exhibits at the Foundry Exhibition, held recently by the Department of Industrial Metallurgy of the University of Birmingham

widespread belief that foundry work is dismal and dirty. Today, however, many foundries—and especially those employing the newer techniques—offer working conditions equal to those in any other branch of engineering. Moreover, the engineering and production problems encountered in founding present a field of interest to the young technologist at least equal to those of any other of the applied sciences. The foundry trade, in general, is tremendously alive, as is evidenced by the great number of novel processes that has reached the stage of commercial exploitation in the last few years, and perhaps even more clearly shown by the manner in which the older craft of conventional sand-moulding has been improved to meet the challenge of the new techniques. Foundry technology is in an expansive stage, and offers exciting possibilities to new entrants.

H. K. B.

INDUSTRIAL BUILDING. In the first quarter of the year the number of new industrial buildings and extensions approved (of individual areas mainly exceeding 5,000 sq. ft.) was 548, with a corresponding total area of 15,997,000 sq. ft. For the full year 1960, the total of approvals was 3,012, for a total area of 88,836,000 sq. ft., the highest since 1955.

Soviet Exhibition

According to preliminary reports, The Soviet Exhibition, which will open at Earls Court, London, on July 7, and continue until July 29, will cover a very wide range of activities. Like the recent British Trade Fair in Moscow, it will be held under the joint sponsorship of the Association of British Chambers of Commerce, and the Chamber of Commerce of the U.S.S.R. Sections will be devoted, for example, to science; the cosmos; optics; the atom; power generation and electrification; coal; chemistry; machine tools and industrial equipment; construction; iron, steel and non-ferrous metallurgy; oil and gas; transport; agriculture; education; welfare; health promotion; and culture.

In the science section attention will be drawn, for instance, to the results of work carried out in connection with the synthesis of "super-hard" substances; generation and applications of ultrasonic energy; spark machining; and plant for the electric alloying of metal surfaces.

Machine tools to be displayed will include, it is stated, a type 584 M semi-automatic, programme-controlled, machine for grinding the teeth of helical gears on both flanks simultaneously, and a type 1712 P, semi-automatic, multi-tool lathe, also with programme control. There will also be a model of an automatic machine line for the production of roller chain, and a display of foundry equipment.

Film on Bright Steel Bar Production

Coghlan Bright Steel, Ltd., Hunslet Forge, Leeds, 10, have recently produced a film, entirely in their own works, which shows the whole process of bright steel bar production, from the arrival of the steel in billet form. This 16-mm. sound and colour film runs for 23 min., and whereas many films are available on the production and uses of steel, it is believed that it is the first to be devoted solely to this particular aspect.

The film is available on loan, free of charge, to any genuinely interested firm or organization.

Industrial Notes

HAYES ENGINEERING SERVICES. The address of this company is now 202 Merry Hill Road, Bushey, Herts.

SIDNEY G. JONES, LTD., 8 Balham Hill, London, S.W.12. The telephone number of this company is now Kelvin 2133.

JAMES NEILL & CO. (SHEFFIELD), LTD. The address of the Glasgow office of this company is now 50 Wellington Street, Glasgow, C.2.

VACTRIC CONTROL EQUIPMENT, LTD. The address of this company is now 30 Bouverie Street, London, E.C.4 (telephone, Ludgate Circus 7061, telegrams, Vactrol, London, E.C.4).

BISHOP, EAVES & SONS, LTD., 868 Alum Rock Road, Birmingham, 8, have been appointed sole agents in the United Kingdom for the range of grinding and milling machines made by Robert Blohm, Hamburg-Bergedorf.

PARKINSON COWAN, LTD., Terminal House, Grosvenor Gardens, London, S.W.1, are now making and marketing two gas meters—types B 1,200 and B 2,000—which have been designed specifically for industrial installations using gas at pressures up to 100 lb. per sq. in.

ASSOCIATION OF LIGHT ALLOY REFINERS AND SMELTERS, 3 Albemarle Street, London, W.1, have issued an addendum to the standard classifications and segregation schedule for aluminium and aluminium alloy scrap, to conform to recent changes in aircraft specifications.

EMPLOYMENT IN THE MANUFACTURING INDUSTRIES. There was an increase of 22,000 in April in the number of people employed in manufacturing industries, to a total of 8,916,000. There was a rise of 7,000 in "engineering and electric goods," of 4,000 in "vehicles," and of 1,000 in "metal manufacture." For shipbuilding and marine engineering there was no change.

THE STEEL, PEECH & TOZER branch of The United Steel Companies, Ltd., The Mount, Broomhill, Sheffield, 10, over the next five years, will replace 21 open-hearth furnaces by six 110-ton capacity electric arc furnaces. This development, it is stated, will provide the works with the largest electric steel-making installation in the world, with an annual ingot capacity of 1,350,000 tons.

JOHNSON MATTHEY & CO., LTD., 78-83 Hatton Garden, London, E.C.1, have issued a new series of data sheets which are devoted to their extensive range of small-bore tubes and tube products.

Tubes to fine limits are available principally in non-ferrous metals and alloys, although grades in nickel-iron alloy are supplied, as well as tubes in precious metals for specialized applications.

THE NATIONAL MACHINERY CO., Tiffin, Ohio, U.S.A., inform us that as from July 1, their forging and cold heading equipment, also that of their associated company, J. G. Kayser, G.m.b.H., of Nürnberg, will be sold and serviced through their United Kingdom office: National-Kayser, 429 Birmingham Road, Sutton Coldfield, Warwickshire. (Telephone, Erdington 4192. Telegrams, Nakayma, Sutton Coldfield.)

ANDREW FRASER & CO., LTD., 64-65 Vincent Square, Westminster, London, S.W.1, have introduced the series S.D.S. Mono-Radial pumps of compact design with capacities from 1·8 to 5·4 gal. per min., at pressures up to 6,000 lb. per sq. in. Of self-priming type, with a normal running speed of 1,500 r.p.m., these new pumps can be supplied for foot or flange mounting.

THE JOINT BRITISH COMMITTEE FOR STRESS ANALYSIS, 1 Birdcage Walk, London, S.W.1, announce that the second International Conference on Stress Analysis will be held at 1 Ecole Supérieure d'Aeronautiques, Boulevard Victor, Paris 15e, France, from April 10 to 14, 1962. The official languages of the conference will be English, French and German, and the possibility of providing simultaneous translation facilities is being considered.

COURSES IN WORK STUDY.—Borough Polytechnic, Department of Mechanical Engineering, Borough Road, London, S.E.1, are offering the following courses in work study, starting in September: endorsement to H.N.C. in mechanical engineering—part time day and evening; Institute of Work Study Certificate course—evening; City and Guilds of London Institute course—part time day. Further particulars can be obtained from the above address.

LOEWY ENGINEERING CO., LTD., Bournemouth, a member company of the T.I. Engineering Division, have secured a contract from East Germany, to the value of approximately £1¼ million, for the supply of equipment for hot and cold rolling aluminium strip and foil. The contract follows negotiations which were initiated during the Leipzig Spring Fair, and the equipment is to be installed in factories in the Leipzig area.

DORMAN MACHINERY SALES, LTD., Woodside Hill, Chalfont St. Peter, Bucks., have recently been appointed sole British agents for the Synchromat programme-controlled automatic multi-tool and copying lathe, built by Salomé Frères, Paris. A comprehensive catalogue describing this lathe is available from the above address. The Synchromat will be displayed on the stand of the makers at the forthcoming European Machine Tool Exhibition in Brussels.

FLEXIBOX, LTD., Nash Road, Trafford Park, Manchester, 17, have concluded an agreement with ALFRED HERBERT, LTD., Coventry, whereby the latter company is appointed sole agent for the United Kingdom for the sale of the Flexibox range of lapping machines. These machines are intended for the production of accurate plane surfaces on parts made from almost any constructional material including ferrous and non-ferrous metals, plastics, glass, carbon and semi-conductor crystals.

G. B. FILM LIBRARY, 1 Aintree Road, Perivale, Middlesex, have issued a new industrial film catalogue which provides a comprehensive guide to the visual aid material available for training and education purposes in industry. Sections are devoted to films for industrial training, including the "Salesman-training" series; technical educational films; sponsored (free-hire) films; and technical filmstrips.

Synopses are given, also particulars of hire and purchase prices.

HENRY BALFOUR & CO., LTD., are to build a heavy fabrication shop on a site adjacent to their Research and Development Centre at Leven, Fife. The building will be 300 ft. long by 80 ft. span by 50 ft. high to the eaves, and the equipment will include a flame planer supplied by the British Oxygen Co., Ltd., which will be capable of cutting plates up to 45 ft. long by 12 ft. wide by 3 in., and hydraulic plate bending equipment by Hugh Smith & Co. (Possil), Ltd., for forming cylinders from 3-in. thick mild steel to various diameters. There will also be British Oxygen automatic welding equipment of the Quasi-Arc ram boom type, incorporating Unionmelt, Fusarc, and Fusarc/CO_2 welding heads, and roller beds for loads up to 100 tons.

AGENCIES FOR SOUTH AFRICA WANTED. Tool & Steel Supplies, P.O. Box 81, Springfield, Johannesburg, who are trading as merchants and manufacturers' representatives, inform us that they are seeking to widen their field of activities to cover, as far as possible, all requirements for general engineering purposes. In this connection they wish to obtain sole agencies for manufacturers who either have not been previously represented or are seeking new agents. As examples of the products which they would be interested in handling the following may be noted: milling, slotting, planing, gear cutting, surface grinding, tapping and threading machines and other machine tools; die casting machines and metal melting furnaces; presses; dieheads, tapping attachments and chucks, die blocks, shear blades and machine knives; portable, engineers', and small tools; materials handling equipment; scientific and laboratory equipment; and non-ferrous metals, tool and die steels, other special steels, ground flat stock, and stainless steel sheets.

Possibilities of Hard-particle Impregnation of Sliding Surfaces

(*Continued from page* 3)

sliding contact, and some incidental confirmation of the results here briefly discussed has been afforded in connection with a swash-plate type of fuel pump. For experimental purposes, in order to accelerate wear, this pump was supplied with fuel contaminated with silica. It was found, however, that certain surfaces in fact became impregnated with silica particles and that the rate of wear which normally occurred with clean fuel was reduced by some 50 per cent.

It has been clearly established that the friction and wear resistant characteristics of hard steel surfaces, at least in certain circumstances, can be greatly improved by impregnation with diamond, and probably with certain other types of hard particles. The extent to which this treatment can be successfully applied in practice remains to be established, and much further research will be required. In view of the potential importance of the discovery, however, it is to be hoped that the necessary investigations will be vigorously pursued.

MACHINERY'S ENQUIRY BUREAU

For many years MACHINERY has provided an enquiry service not only for subscribers and advertisers but for all engineers in need of such information as the names of makers—or their agents—of machines or equipment for performing particular operations, suppliers of various classes of material, firms with facilities for undertaking certain types of work, owners of trade names, and agents for foreign machine builders. If you have such a problem write (MACHINERY, Enquiry Bureau, Clifton House, 83-117 Euston Road, London, N.W.1) or telephone (Euston 8441, 2 lines). This service is, of course, entirely free.

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Trade Publications

LANDIS MACHINE CO., Waynesboro, Penn., U.S.A. Bulletin G-102 illustrates and describes the company's stationary and rotary valve taps. Heads are available for backward tapping only, with single-end chasers, and for tapping both seats from one end of the valve with double-end chasers.

DAWE INSTRUMENTS, LTD., Harlequin Avenue, Great West Road, Brentford, Middlesex. Leaflet describing the type 1208 Variphase strobe unit which has been designed to enable components or equipment undergoing vibration test to be viewed stroboscopically in "slow motion," at frequencies within the range from 5 c/s to 5 kc/s.

CRODA, LTD., Snaith, Goole, Yorks. Data sheet on Promex cold applied strippable coating, which is stated to be a complementary product to the company's Crocell range of hot dip strippable plastics coatings. Items which cannot conveniently be dipped in heated baths, or do not require thick films, can be immersed in cold liquid Promex and allowed to dry. Application can also be made by brushing or spraying.

Books Received

SELL'S DIRECTORY FOR 1961. Business Directories, Ltd., 133-137 Fetter Lane, Fleet Street, London, E.C.4. 2,350 pp. [Price £4 or £2 12s. 6d. per year for three years or more.]

Now in its 76th year of publication, this invaluable directory of registered telegraphic addresses, with telephone numbers and classified trades, requires no introduction. The principal sections provide an alphabetical list of firms, sub-divided under the headings London and "country," with particulars of title, trade or profession, postal address, telegraphic code used, telephone number, and registered telegraphic address; an alphabetical list of telegraphic addresses, again with London and "country" divisions; and Sell's classified trades list of the chief business concerns of the United Kingdom and Ireland in all trades. In addition, there is an index to Telex subscribers, a special list of contractors, and sections concerned with electronics (communication and automation), the motor and allied industries, the newspaper press, the nuclear power industries, the Stock Exchange, and trade marks and brands.

B.D.I.—GERMANY SUPPLIES, 1961-1962. *Uebersee-Post*, Verlag Obst Co. Kg., Nuernberg 2, West Germany. 2,000+ pp. [Price £4 10s. including postage.]

This directory, which is published by the Federation of German Industries, is now in its 5th edition. There are alphabetical indexes of German industrial products in German, English, French, and Italian, and the English index, for example, extends to 191 pages. These indexes refer to the main directory section which is subdivided into 42 industrial groups, concerned, for instance, with the iron and steel producing industry, drawing plants and cold rolling mills, foundry products, mechanical engineering, and the tool and precision tool industry. Pages devoted to a particular group are identified by the number for that group in heavy type (white on black). Within each group, the individual products are numbered, each being described in the four languages. Thus, product 1 in group 16 is "dressing tools (without diamonds)." In addition, where products are related, they are classified under sub-group headings. For example, in main group 16, products 16-25 are "drilling and boring tools for metal working." Under this sub-heading, the individual numbers appear, such as 16 twist drills, 17 centre drills, 19 boring bars, and so on. For each product, names and addresses of suppliers are listed, and at the start of each main group, registered trade marks are shown. The system of classification described greatly facilitates reference, and as an indication of the scope of the publication, it may be mentioned that some 70,000 types of goods and equipment are listed. Finally, there is an alphabetical list of German export firms with registered trademarks, addresses, telephone numbers, telegraphic addresses, telex numbers, and industrial group numbers.

Scrap Metals

†LONDON.—‡Prices per ton for non-ferrous scrap metals free from iron are as follows:—Clean copper wire, untinned and free from lead and solder, £205; clean heavy copper, untinned and free from lead and solder, £200; copper wire No. 2, £196; clean light copper, £192; braziery copper, £168; gunmetal, £178; brass, mixed, £130; lead, net, £50; zinc, £40; cast aluminium, £93; old rolled aluminium, £96; battery lead, £25; unsweated brass radiators, £105; hollow pewter, £555; black pewter, £435.

MIDLANDS.—Tin prices have continued to advance and recently the movement has been accelerated and there has been a rise of more than £50 per ton. The shortage in supplies of this metal which has been apparent for some time is likely to continue, and further increases in prices are foreseen.

In a rather nervous market, copper prices have eased and merchants have been more cautious in buying for stock small quantities of any grade which may be held for a week or two before a sale is made. In general, trading is good, and metal is changing hands steadily, outlets being available for all grades.

The position of metals affected by changing market values is generally as follows:—

Copper.—Prices for the better grades, including bright wire and heavy material, have fallen by approximately £3 per ton, and for No. 2 wire and braziery scrap the reductions have been somewhat greater.

Brass.—There is a good demand, especially for solid scrap, but prices have eased by about £2 per ton. Brass rod swarf is approximately equal in value to mixed scrap.

Gunmetal.—A consistently good tone prevails with very little change in prices.

Lead.—A slight movement in market prices has resulted from the rather greater interest that is being shown by consumers, and values have increased by £2 per ton.

Aluminium.—A further weakness has developed mainly in connection with old rolled and commercial cast scrap. Prices vary according to demand but, on average, have fallen by £7 to £10 per ton.

Zinc.—Demand is fairly steady and values show no marked change.

† George Cohen, Sons & Co., Ltd., 600 Wood Lane, London, W.12.
‡ Subject to market fluctuations.

Machine Tool Share Market

Stock markets were dull and unsettled in mainly quiet conditions during the period under review, and an easier trend was displayed in nearly all sections.

British Government stocks suffered an all-round decline from which they showed little recovery and the same applied to Home Corporation and Dominion loans.

Commercial and industrial markets were depressed for the most part, and share prices generally tended to fall. Although a rallying tendency developed towards the finish, changes on balance were irregular with declines predominating.

Among machine tool issues Edgar Allen lost 6d. at 41s. 6d.; Arnott & Harrison, 1s. at 15s. 6d.; Asquith Machine Tool, 6d. at 10s.; Birmingham Small Arms, 6d. at 25s.; Chas. Churchill, 1½d. at 8s. 4½d.; Coventry Gauge & Tool, 6d. at 31s. 4½d.; Craven Bros. (Manchester), 6d. at 8s. 9d.; B. Elliott, 3d. at 4s. 3d.; Greenwood & Batley, 1s. 3d. at 23s. 9d.; Alfred Herbert, 3s. at 69s. 6d.; John Holroyd "B," 3s. at 17s. 6d.; Kerry's (Gt. Britain), 1½d. at 10s. 6d.; Macready's Metal, 6d. at 16s. 6d.; Newall Engineering, 6d. at 9s.; John Shaw & Son (Wolverhampton), 6d. at 18s. 4½d.; Stedall & Co., 6d. at 7s. 9d.; Tap & Die Corporation, 6d. at 16s. 6d.; and Thos. W. Ward, 1s. 3d. at 77s. 6d.

Personal

Mr. S. W. Allsopp has resigned his position with Renault Machine Tools (U.K.), Ltd., Shrewsbury, and has joined Herbert Widdowson & Sons, Ltd., Canal Street Works, Nottingham, as development engineer concerned with Berardi unit construction machines incorporating Berardi unit heads. The equipment will range from simple arrangements of heads on bases to rotary and in-line transfer machines, and Mr. Allsopp will be available throughout the United Kingdom at short notice for detailed technical discussions.

The following new appointments have been announced:—

MR. J. S. HONESS, Grad.I.E.E., as sales planning engineer of George Ellison, Ltd., Perry Barr, Birmingham, 22B.

MR. JOHN WINFIELD to the sales staff of Alfred Ellison, Ltd., Black Lake Ironworks, West Bromwich. He will be responsible for sales and consultative service for grey iron castings in the Midlands.

MR. R. A. NISBET, A.M.I.E.E., as regional manager (South) for Dewhurst & Partner, Ltd., Inverness Works, Hounslow. He has been with the company for 17 years and was formerly group controller for the Southern region.

COMPANY		Denom.	Middle Price
Abwood Machine Tools, Ltd.	Ord.	1/-	2/3
Allen (Edgar) & Co., Ltd.	Ord.	£1	41/6
" "	5% Prf.	£1	13/6*
Arnott & Harrison, Ltd.	Ord.	4/-	15 6
Asquith Machine Tool Corp., Ltd.	Ord.	5/-	*10/-
" " "	6% Cum. Prf.	£1	16/6
Birmingham Small Arms Co., Ltd.	Ord.	10/-	25/-
" " "	5% Cum. "A" Prf.	£1	14/6
" " "	6% Cum. "B" Prf.	£1	17/-
" " "	4% 1st Mort. Deb.	Stk.	90½
British Oxygen Co., Ltd.	Ord.	5/-	21/6
" "	8% Cum. Prf.	£1	19/6
Brooke Tool Manufacturing Co., Ltd.	Ord.	5/-	9/10½
Broom & Wade, Ltd.	Ord.	5/-	24/9
" "	6% Cum. Prf.	£1	16/6
Brown (David) Corporation, Ltd.	5½% Cum. Prf.	£1	15/-
Buck & Hickman, Ltd.	6% Cum. Prf.	£1	17/-xd
Butler Machine Tool Co., Ltd.	Ord.	5/-	16/3
" " "	5% Cum. Prf.	£1	14/3
Churchill (Charles) & Co., Ltd.	Ord.	2/-	8/4½
" " "	6% Cum. Prf.	£1	25/4½‡
Clarkson (Engrs.), Ltd.	Ord.	5/-	40/-
Cohen (George), 600 Group, Ltd.	Ord.	5/-	12/6
" " "	4½% Cum. Prf.	£1	12/6
Coventry Gauge & Tool Co., Ltd.	Ord.	10/-	31/4½
" " "	5% Cum. Red. Prf.	£1	16/3
Craven Bros. (Manchester), Ltd.	Ord.	5/-	8/9
Elliott (B.) & Co., Ltd.	Ord.	1/-	4/3
" "	4½% Red. Cum. Prf.	£1	12/-
Firth Brown Tools, Ltd.	4% Cum. Prf.	£1	11/-
Greenwood & Batley, Ltd.	Ord.	10/-	23/9
Harper (John) & Co., Ltd.	Ord.	5/-	8/4½
" " "	4½% Red. Cum. Prf.	£1	11/7½
Herbert (Alfred), Ltd.	Ord.	£1	69/6
Holroyd (John) & Co., Ltd.	"A" Ord.	5/-	22/6
" "	"B" Ord.	5/-	17/6
Jones (A. A.) & Shipman, Ltd.	Ord.	5/-	29/-
" " "	7% Cum. Prf.	5/-	4/9
Kearney & Trecker-C.V.A., Ltd.	5½% Red. Cum. Prf.	£1	11/-
" " "	Prefd. Ord.	£1	13/9
Kearns (H. W.) & Co., Ltd.	Ord.	5/-	25/-
Kerry's (Gt. Britain), Ltd.	Ord.	5/-	10/6
Macreadys Metal Co., Ltd.	Ord.	5/-	16/6
Martin Bros. (Machinery), Ltd.	Ord.	2/-	2/6
Massey (B. & S.), Ltd.	Ord.	5/-	11/-
Newall Engineering Co., Ltd.	Ord.	2/-	9/-
Newman Industries, Ltd.	Ord.	2/-	7/-
" "	6% Prf. Ord.	5/-	5/-
Noble & Lund, Ltd.	Ord.	2/-	6/-
Norton, W. E. (Holdings), Ltd.	Ord.	2/-	9/-
Osborn (Samuel) & Co., Ltd.	Ord.	5/-	51/3
" " "	5½% Cum. Prf.	£1	23/-
Pratt (F.) & Co., Ltd.	Ord.	5/-	18/9
Sanderson Kayser, Ltd.	Ord.	10/-	35/7½
" "	6½% Cum. Prf.	£1	16 3
Scottish Machine Tool Corporation, Ltd.	Ord.	4/-	9/6xd
Shardlow (Ambrose) & Co., Ltd.	Ord.	£1	62/6
Shaw (John) & Sons, Wolverhampton, Ltd.	Ord.	5/-	18/4½
Sheffield Twist Drill & Steel Co., Ltd.	Ord.	4/-	18/3xd
" " "	5% Cum. Prf.	£1	13 9xd
Stedall & Co., Ltd.	Ord.	5/-	7/9
Sykes (W. E.), Ltd.	"B" non-voting Ord.	10/-	30/-
Tap & Die Corporation, Ltd.	Ord.	5/-	16/6
" " "	4½% Deb. 1961-1977	Stk.	82½
Wadkin, Ltd.	Ord.	10/-	26/-
Ward (Thos. W.), Ltd.	Ord.	£1	77/6
" "	5% Cum. 1st Pref.	£1	13/6
" "	5% Cum. 2nd Pref.	£1	21/6
Willson Lathes, Ltd.	Ord.	1/-	3/-

The Middle Prices given in the list are in several cases nominal prices only and not actual dealing prices. Every effort is made to ensure accuracy, but no liability can be accepted for any error. * Sheffield price. ‡ Birmingham price.

PRICES OF MATERIALS

All prices per ton except where otherwise stated.

Pig Iron

Foundry and Forge No. 3, Class 2

Middlesbrough (10 tons or over)	£21 17 0
Birmingham (10 tons or over)	£21 9 3

Phos. Over 0·1 up to 0·4%

Birmingham (6 ton lots)	£23 5 0
Grangemouth (6 ton lots)	£23 10 0

Hæmatite English No. 1 (10 tons or over)

N.E. Coast (made in N.E.)	£23 19 0
Scotland	£24 5 6
Sheffield	£25 9 0
Birmingham	£25 13 0

Welsh 10 tons or over £23 19 0

Steel Products

Medium plates (50 tons and over)	£43 16 6
Mild steel plates, ordinary (50 tons and over)	£40 7 0
Boiler plates (50 tons and over)	£42 17 0
Flat bars, 5 in. wide and under (50 tons or over)	£39 1 0
Round bars, under 3 in. (50 tons or over)	£39 1 0
Billets, rolling quality, soft U.T. (100 tons or over)	£31 15 6

Phosphor Bronze

Ingots (2B8) (A.I.D.) d/d	£319 0 0

Copper

Cash (mean)	£232 12 6
Cold rolled and hot rolled sheets 4 ft. by 2 ft. by 10 SWG	£311 10 0—£312 5 0
Rods, $\frac{7}{16}$ in. to $\frac{1}{2}$ in. diam.	£327 0 0
Tubes, $1\frac{1}{4}$ in. bore by 10 SWG, ton lots, per lb.	3s. 2½d.
Wire rod, black, hot-rolled ($\frac{1}{4}$–$\frac{7}{16}$ in.), English	£248 2 6

Zinc

Refined, minimum 98 per cent purity, current month (mean)	£78 7 6

Brass

Tubes, solid drawn, basis per lb.	1s. 10½d.
Strip 63/37, 6in. by 10 SWG coils, ton lots	£260 5 0—£263 5 0
Rods, ½-3 in. diam. (59 per cent copper)	2s. 0½d.

Yellow Metal

Condenser plates, per ton	£192 0 0
Rods, per lb.	2s. 1½d.

Aluminium

Ingots, min. 99·5 per cent Canadian d/d	£186 0 0

Tinplates

*U.K. Home trade: Cold reduced, f.o.r. makers works (15-50 tons)	£3 6 8
U.K. Export: Hot rolled basis, f.o.r. works port	73s. 6d.—76s. 0d.
Cold reduced basis, f.o.r. works port	73s. 6d.—76s. 0d.

Gunmetal

Ingots, B.S. 1400 L.G.2, delivered	£223 0 0

* Official maximum price, after allowing for adjustments for increase in price of tin.

MAKERS' PRICES

Hexagon Steel Bars[1]

Sizes in inches from 1 in. up to 2·21 and 2·41 a/f ex works, 2 tons basis	£42 17 6†
Free cutting black	£46 14 6†

Reeled Steel Bars[1]

Single-reeled, 1½ in. upwards, f.o.r. works (+ usual extra for sizes)	£43 9 0†
Free cutting	£47 7 0†

Precision-ground Mild Steel[2]

1-in. diam. ± 0·00025-in. 4-ton lots, per cwt.	124s. 6d.

Bright Ground Stainless Steel Bars[2]

EN56AM (martensitic, free cutting)	£304 10 0
EN58AM (austenitic free cutting)	£377 10 0

Prices are basic, subject to extras.

High-speed Steel

Black random length bar. All prices basic, per lb., subject to extras:

Molybdenum "66"	6s. 5d.
Molybdenum "46"	6s. 3d.
14 per cent tungsten	6s. 11d.
16 per cent tungsten	7s. 4d.
18 per cent tungsten	7s. 9d.
22 per cent tungsten	9s. 2d.
5 per cent cobalt	10s. 10d.
4·75/5·25 molybdenum + 6·0/6·75 tungsten + 1·75/2·05 vanadium per cent (5-6-2)	6s. 7d.

Precision-ground, High-speed Free-turning Brass Rod[2]

½-in. diam. ±0·00025-in., 2 ton lots, per lb.	2s. 7½d.

Grey Iron Rod

Die Cast[4] in random lengths 18 in. to 26 in. rough machined $\frac{1}{16}$-in. above listed size. Extra for definite lengths. Discounts for orders over £150.

	Per cwt. net. Mark I	Mark III
¾ or ⅞ in.	260s. 3d.	338s. 3d.
1 or 1¼ in.	208s. 4d.	267s. 3d.
1½ to 1⅞ in.	146s. 3d.	181s. 7d.
1⅞ to 2 in.	112s. 7d.	133s. 6d.
2¼ to 3¼ in.	97s. 1d.	112s. 9d.
3½ to 12 in.	91s. 9d.	105s. 3d.

Continuous Cast

10-ft. lengths, centreless machined 1 to 3-in. diam. + 0·010 to 0·020 in., prices as quoted for die cast bar[4]		
centreless ground 1 or 1¼ in. +0·010 in. Extra		208s. 4d.
for hardenable alloy iron[5]	1¼ to 1¾ in.	146s. 3d.
	1⅞ in. to 2 in.	112s. 7d.
Per cwt. net	2¼ to 3¼ in.	97s. 1d.

Stellite[6]

Welding Rods, plain

¼ in. diam., per lb.	30s. 0d.

Toolbits

¼ in. sq. × in., each	22s. 3d.

[1] Colvilles, Ltd., Glasgow, and 17 Grosvenor Street, London, W.1. [2] Pratt, Levick & Co., Ltd., Chester. [3] Spartan Steel & Alloys, Ltd., St. Stephens Street, Birmingham, 6. [4] Sheepbridge Alloy Castings, Ltd., Sutton-in-Ashfield. [5] "Flocast," Harold Andrews Sheepbridge, Ltd., Halesowen. [6] Deloro Stellite, Ltd., Highlands Road, Shirley, Solihull.

† Plus 1 per cent.

BASIC PRICES FROM LONDON STOCK[‡]

Free Cutting Steel

Bright cold drawn: (Usaspead) over 1 to 2 in.	£59 4 6‡
Lead bearing (Usaled)	£63 11 0‡
Precision ground, 1¼ in.	£84 14 6‡

Bright Drawn

M.S. bars (M.M.C.) over 1¼ to 2 in.	£56 10 0‡
Square edge flats (Usaflat)	£73 6 6‡
M.S. angles (Usaspead)	£100 6 6‡
Case hardening (EN) (Usacase over 1¼ to 2 in.	£62 10 0‡
M.S. bars (EN3B) (Usamild) over 1¼ to 2 in.	£58 16 6‡
Carbon manganese semi-free cutting case hardening (EN202) (Usaspead 202) over 1¼ to 2 in.	£71 5 0‡
35/45 ton tensile (EN6) (Usen) over 1 to 1¼ in.	£67 3 0‡
0·4 carbon normalized (Usaspead "40") over 1¼ to 2 in.	£69 5 0‡
0·45 carbon normalized EN9 (Usaspead 55)	£69 15 0‡
Carbon manganese steel to Specification EN16T (Usaspead 5565), per ton	£126 17 0‡

Ground Flat Stock

18-, 24-, and 36-in. lengths (Usaspeed). List prices plus 10 per cent, less 5 per cent.

Oil Hardening Cast Steel

Non-shrink (Usaspead N.S.O.H.), ¾ in. to 2½ in., per lb.	1s. 11d.
Non-distorting heavy duty (Usaspead H.C.H.C.), ¾ in. to 2½ in., per lb.	4s. 2d.

Silver Steel

(0·194-in. to 1½-in.) Genuine Stubs quality, per lb.	4s. 10d. less 27½%
M.M.C. quality, per lb.	2s. 8d. + 6½%
Boxes of 16 assorted sizes, $\frac{7}{16}$ in. to ⅞ in. diam.	7s. 6d.

Stainless Steel

KE40AM (free cutting), per lb.	3s. 8d

Glacier Machined Bronze Bars

Phosphor bronze (2B8) / Lead bronze	Prices on application

High-speed Steel

18 per cent tungsten. Prices on application. Toolholder bits:

Usaspead "Super" / "Supreme" / Cobalt 10	List price

Shimstock

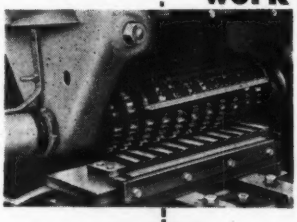
Steel assorted, per tin	3s. 6d.
Brass " "	7s. 3d.

[6] Macready's Metal Co., Ltd., Pentonville Road, N.1. Subject to confirmation by London Office. Delivered free by van in London area.

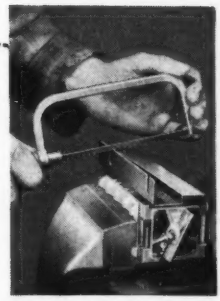
‡ Plus 1 per cent.

Eclipse

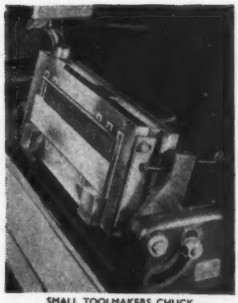
offers the most complete magnetic work holding service



the first name in magnetic tools

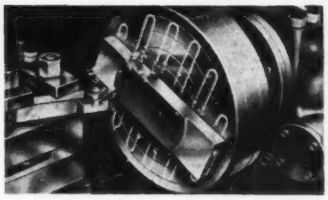


MINOR CHUCK



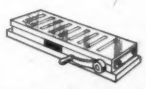
SMALL TOOLMAKERS CHUCK MOUNTED ON SWIVELLING BRACKET

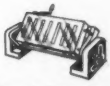
RECTANGULAR CHUCK



HEAVY DUTY CIRCULAR CHUCK

FINE POLE CHUCK





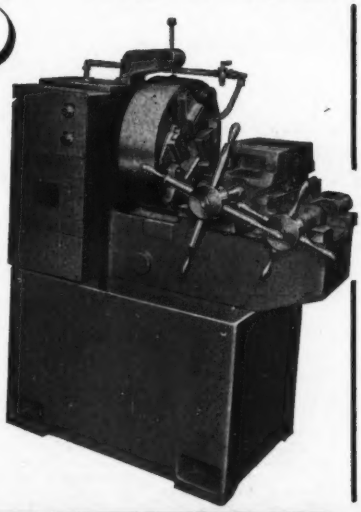
Made by James Neill & Co. (Sheffield) Ltd—the originators of this equipment. Supplies through your usual 'Eclipse' Distributor

PM. 174

HEAP'S

PATENT SCREWING MACHINES

Heaps Universal Screwing Machines are a range of General Purpose Screwing Machines widely used in general Engineering Workshops & Collieries and in the maintenance departments of factories, etc., where the quantities of each class of screwing do not warrant the installation of the Automatic Diehead type of machine.



4" UNIVERSAL SCREWING MACHINE

This machine is fitted with a Stationary Tangential Diehead and Dies of High speed steel can be supplied for almost any type of thread. The vice is of the self-centring type with double jaws for the large sizes. Final drive to the main spindle is through a worm and worm wheel. Speed changes are obtained through "pick-off" gears.

Capacity:

Pipes ..... ¼in. to 4in.

Bolts ..... ¼in. to 2in.

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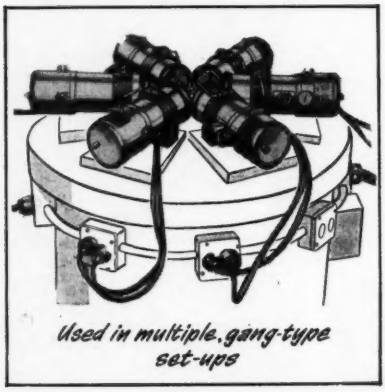
resistance drilling with the DUMORE



Used in multiple, gang-type set-ups

Chuck Capacity 0–$\frac{1}{2}$in.
Voltage 115v. A.C.
Length of Stroke 1$\frac{1}{4}$in.

AUTOMATIC DRILL HEAD

" Resistance drilling " with the Dumore speeds small hole production and virtually eliminates drill breakage as the resistance of the work-piece determines feed and speed. Constant, uniform pressure of the drill permits maximum metal removal without exceeding the breaking point of the drill. Completely automatic, the Series 20 Drill Head leaves operator's hands free.

Built-in Rotary Air Compressor. No air line required—plug drill head cord into electrical outlet.

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Tel. BATTERSEA 5549

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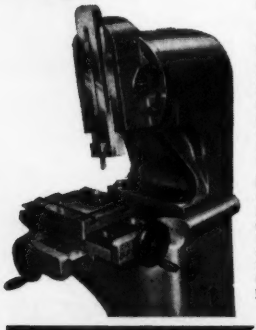
SAVE 25% PRODUCTION TIME!

Leytool 2-inch Stroke Slotting Machine



THE Leytool Slotting Machine is a development of necessity to provide economic manufacture of the 1001 small parts which no other machine can handle. So successful was this machine in their own works that the designers, The Leytonstone Jig and Tool Company, have now developed it to play an invaluable part in both small and large machine shops.
Sturdy, well-built and comprehensive in its uses on production machining of small parts, this machine has accuracy, adaptability and unique features of the greatest possible value in the toolroom. A " great " little machine which in initial cost, production time and trouble-free service offers a 25% overall saving in manufacturing costs of any part.

MARK II This is a simplified version of the Mark I model, constructed from the same heavily designed main castings, but not incorporating the Rotary Table. The two cross slides are hand fed only and the 7in. by 6$\frac{1}{2}$in. rectangular Tee Slotted Table is designed primarily to accommodate production tooling.

MARK I This model is fitted with a very serviceable 7in. diameter Rotary Table, which has been specially hardened, ground and graduated. Rapid, precise setting to within 1/1000th of an inch is provided by the accurately ground centre bore and tenon slots.

Designers and Manufacturers: The Leytonstone Jig and Tool Co. Ltd.

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THE CAUSEWAY, EGHAM, SURREY.
Telephone: EGHAM 4166-7

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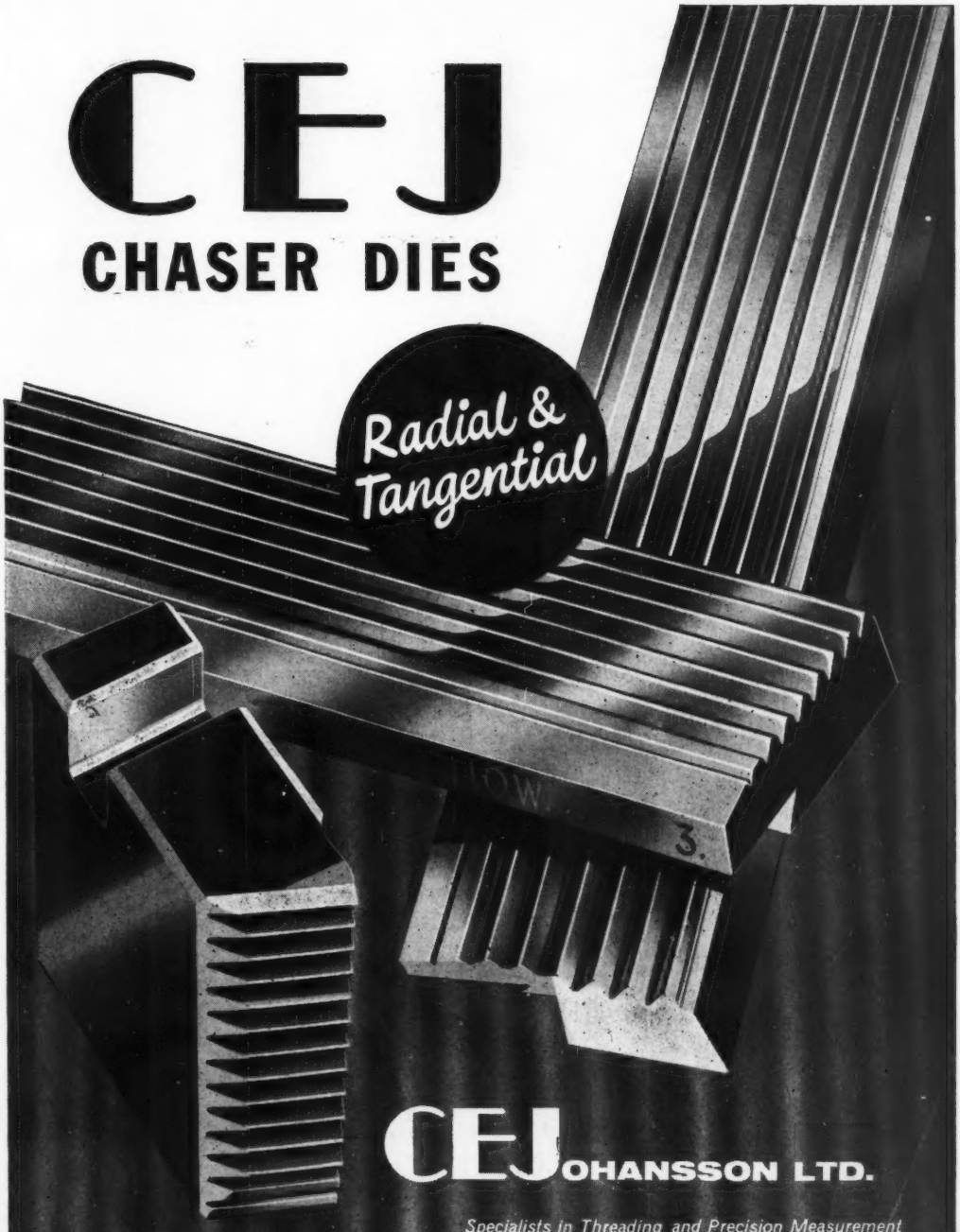

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Specialists in Threading and Precision Measurement

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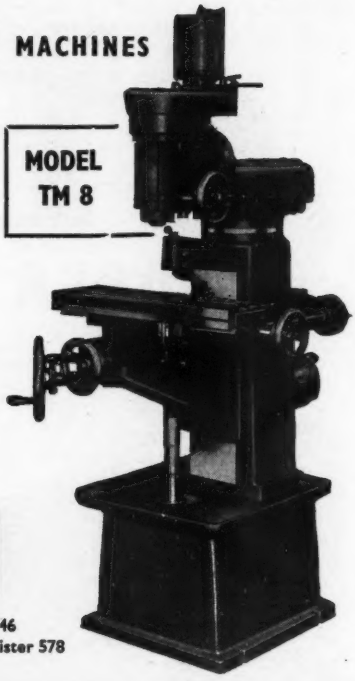
MARLOW VERTICAL MILLING MACHINES



• Backgeared Head 85-1,500 r.p.m. 6 speeds. • 5 speed Direct Drive, 375-2,250 r.p.m. available on Models 1, 2 and 3. • All models have Swivel Head. • Power feed available as an extra on all models except 1 and 2. • Down Feed Head, hand operated, available on Models 4 and 5 and Turret Mills.

STANDARD MILLS

Model	Table	Table to Spindle
1	22in. by 6¼in.	16in.
2	28in. by 6½in.	16in.
3	28in. by 8in.	15in.
4	28in. by 8in.	19in.
5	28in. by 10in.	19in.

MARLOW TURRET MILLS

Radial and Sliding Arm, Swivelling and Down Feed Head. Power Feed to table optional.

Model	Table	Table to Spindle
T.M.8	28in. by 8in.	19in.
T.M.10	28in. by 10in.	19in.

VICTA ENGINEERING CO.
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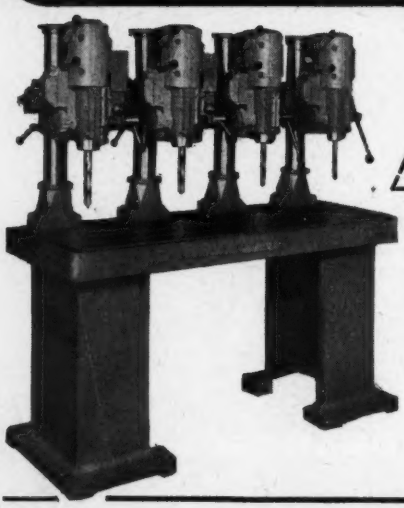
GRIMSTON



production drilling machines . . . . .

Illustrated here is a typical 4-spindle machine arranged in this case with two heads having power feeds. Also available with two or three spindles in any combination of 4, 8, 12 or 16 spindle speeds. Two sizes are made: 19in. with 9½in. throat and 24in. with 12in. throat. Capacities up to 1in. and 1⅛in. diameter. Extras include Coolant pump, reversing, automatic turret heads.

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GRIMSTON ELECTRIC TOOLS LTD. PROGRESS WAY, CROYDON, SURREY
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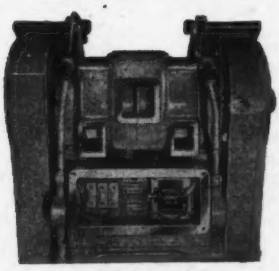
THE NEW MURAD EG8 DUSTLESS GRINDER

- *Filter Resistance Halved*
- *Impeller Capacity Trebled*
- *Eye Shields and Local Lighting*
- *Now Standard*

These are some of the many improvements embodied in the new EG.8 making it without question the best off-hand Grinder in the word. The Murad Dustless Grinder is unique. It embodies its own dust inhibitor which offers protection to both worker and employer and makes the provision of a separate dust extraction plant unnecessary. It can be placed anywhere in the shop to suit the sequence of operations, even in close proximity to precision machines without endangering their slides. The repeat order is the finest tribute that a customer can pay to the efficiency and reliability of a machine tool. Britain's industrial giants have paid this tribute to the Murad Dustless Grinder.

Amongst many Users who send us a constant stream of repeat orders are such world-famous firms as Mullards, Pressed Steel, G.E.C., Atomic Energy Authority, B.T.H., British Oxygen Gilette Industries, Skefko, etc., etc.



Control swichgear is designed into the machine and not added as an afterthought.

The above illustration shows the eyeshield swung up for ease in changing lamps, etc.

Pat. No. 674748

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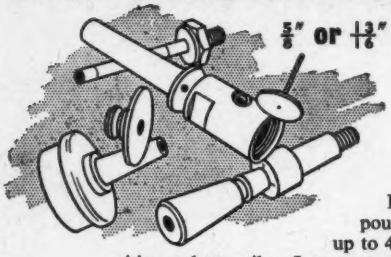
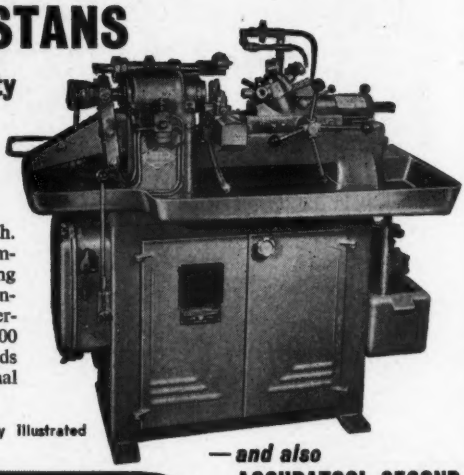
SPEED UP your BAR WORK . . . with ACCURATOOL CAPSTANS



⅝" or 13/16" Bar Capacity



4" turning length. Lever operated compound slide swivelling up to 45°. Unusually sensitive and versatile. Lever operated collet (air operated collet extra). Eight spindle speeds 75–3000 r.p.m. Single lever selects High or Low speeds Forward and Reverse. Many useful items of optional equipment.

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118b.

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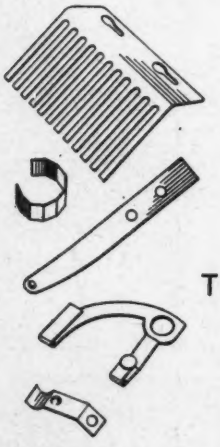
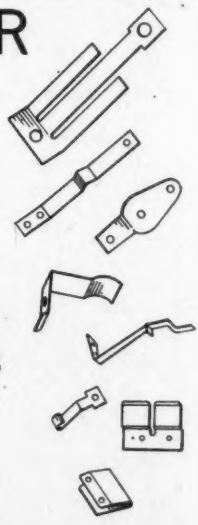


for strip-formed piece parts of all kinds because it combines all the advantages of a copper-base alloy, such as easy formability and high electrical conductivity, with the high tensile strength, fatigue resistance and hardness usually associated with high grade steels. Beryllium Copper strip is generally fabricated into complicated shapes from annealed, quarter or half-hard rolled material prior to hardening to spring temper by simple heat treatment.



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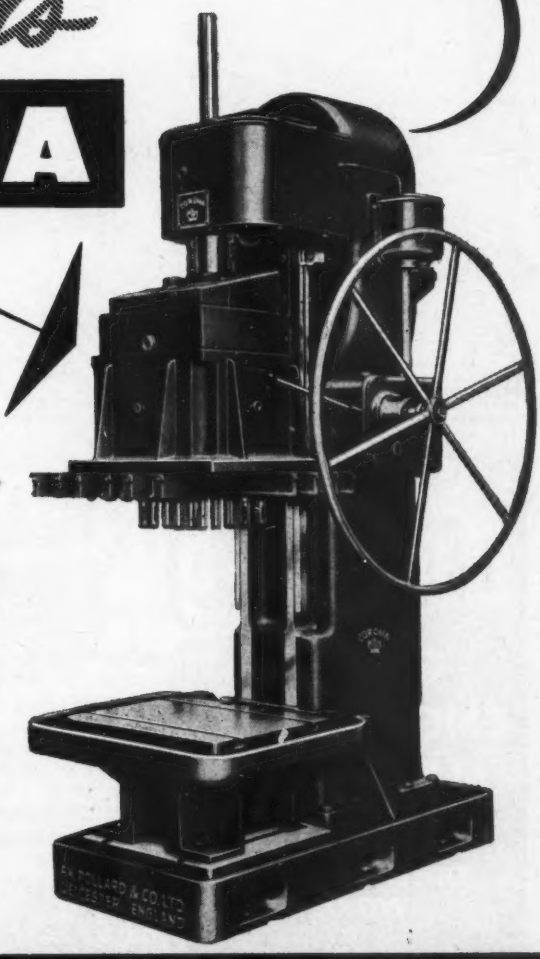
Demands

CORONA



MODEL 20 MX

ADJUSTABLE SPINDLE MACHINE

Drilling area may be either circular or rectangular and all spindles are freely adjustable with individual vertical adjustment for drill wear.

Max. Drilling area (circular frame) 18in. dia.
Max. Drilling area (rectangular frame) 24in. × 14in.
Max. number of spindles No. 1 M.T. 24
Max. number of spindles No. 2 M.T. 16
Max. Drilling capacity (examples) 6—$\frac{7}{8}$in., 12—$\frac{3}{4}$in. or 18—$\frac{1}{2}$in. holes.
Area of box table .. .. 28in. × 22in.

A larger model is available and complete details of both machines will be sent on request.

Both machines are fitted with rapid power traverse to slide.

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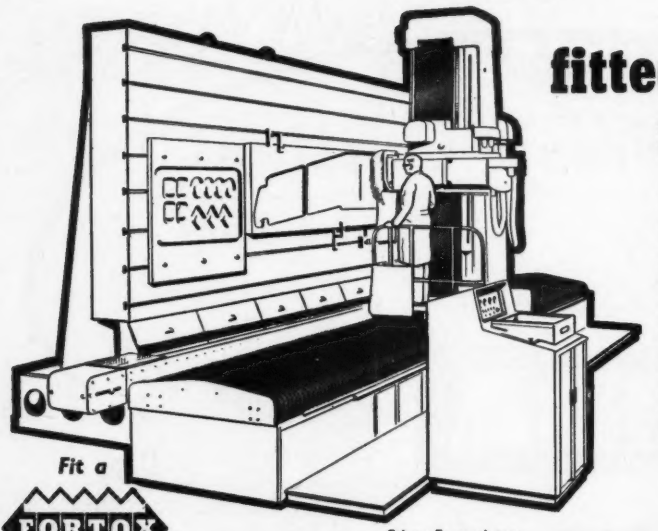

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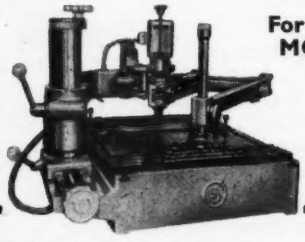

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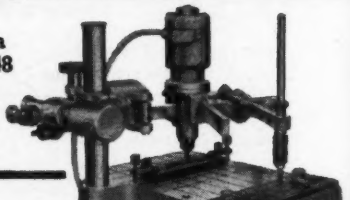

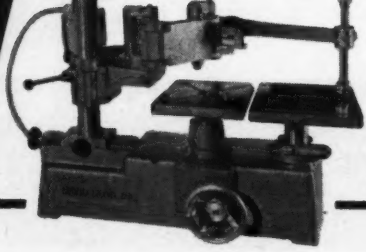

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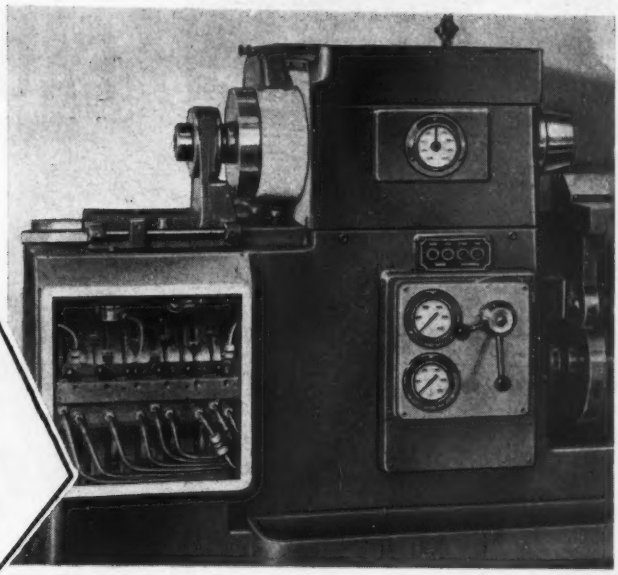

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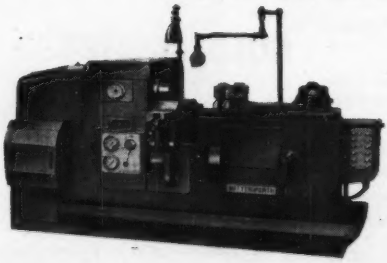

Also 3" Light Duty, 3" Standard, 3½" Standard.

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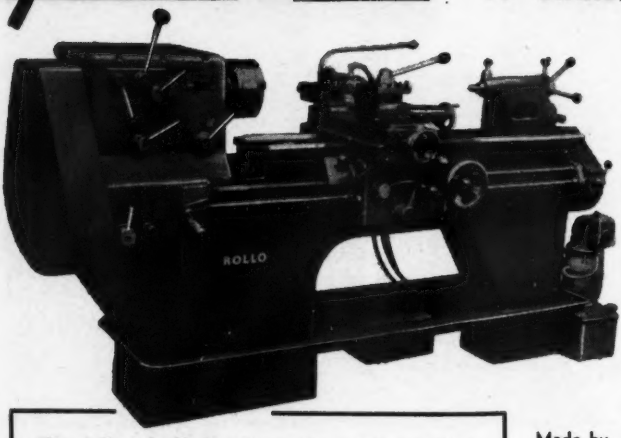

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Copying and Centre Lathe with Auto Feed to Tailstock

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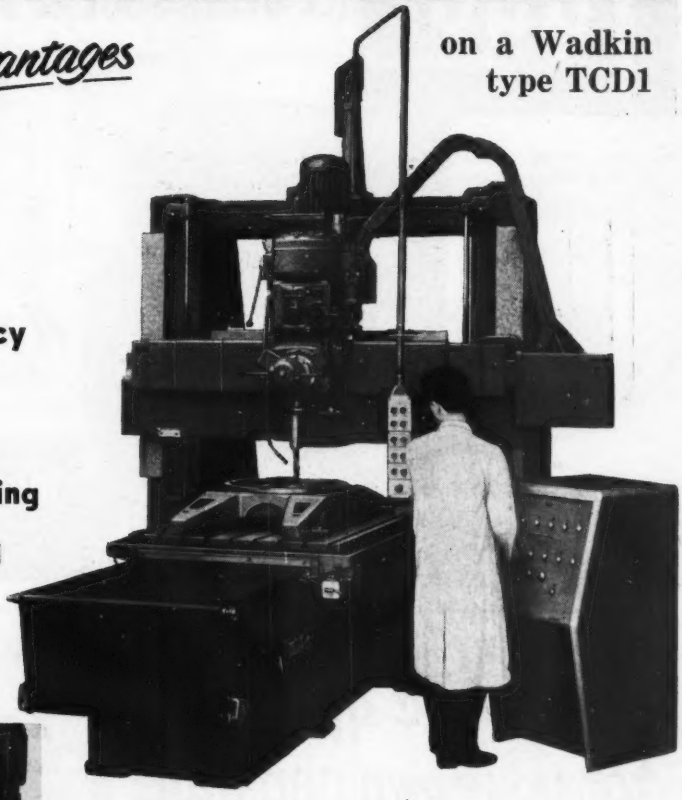
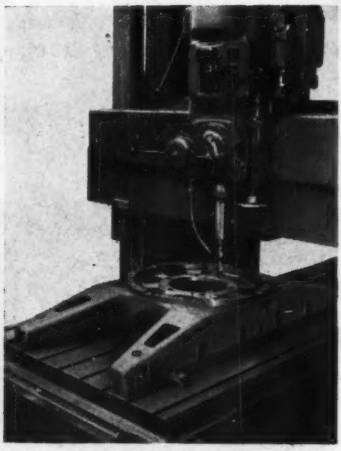
Reasonably Priced





Wadkin Tape Controlled Drilling Machine drilling a cast-iron rotating slideway.

This machine will accurately position holes up to 2in. diameter in steel. It eliminates all marking off as well as the necessity of using drilling fixtures. Once the tape has been punched — a relatively simple operation — exact repetitions of even the most complicated drilling jobs are guaranteed at any time.

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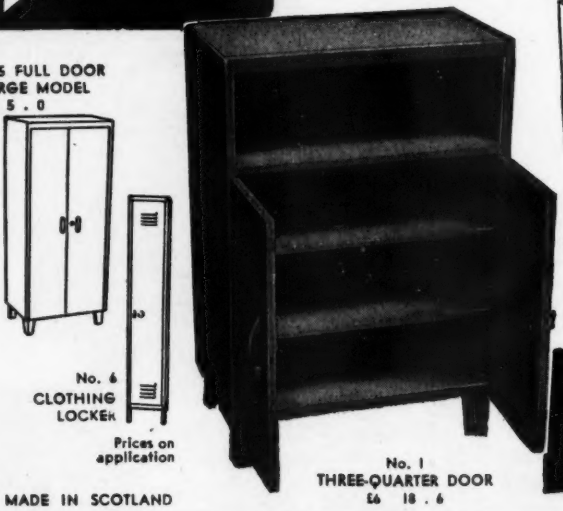

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Spring clutch drive, adjustable torque control, eliminates tap breakage.
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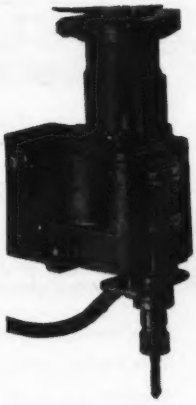

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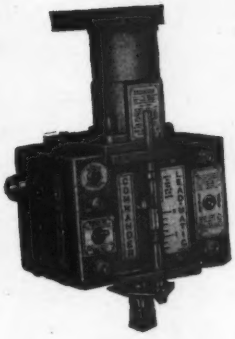

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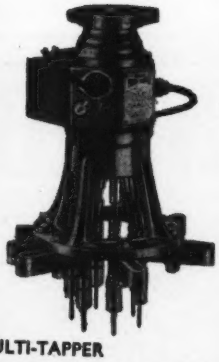

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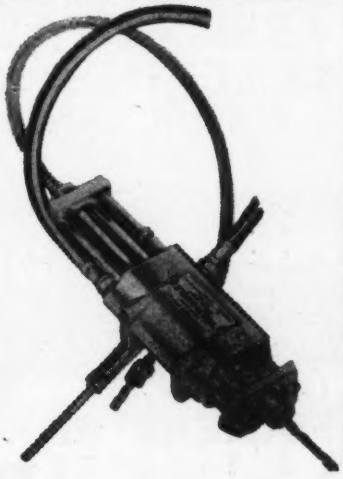

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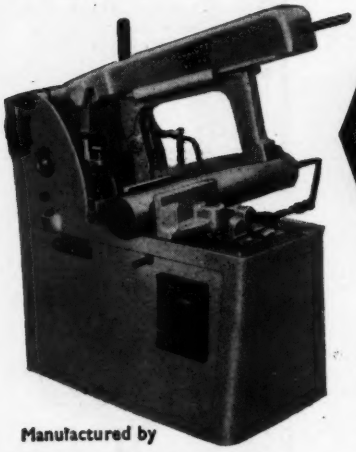

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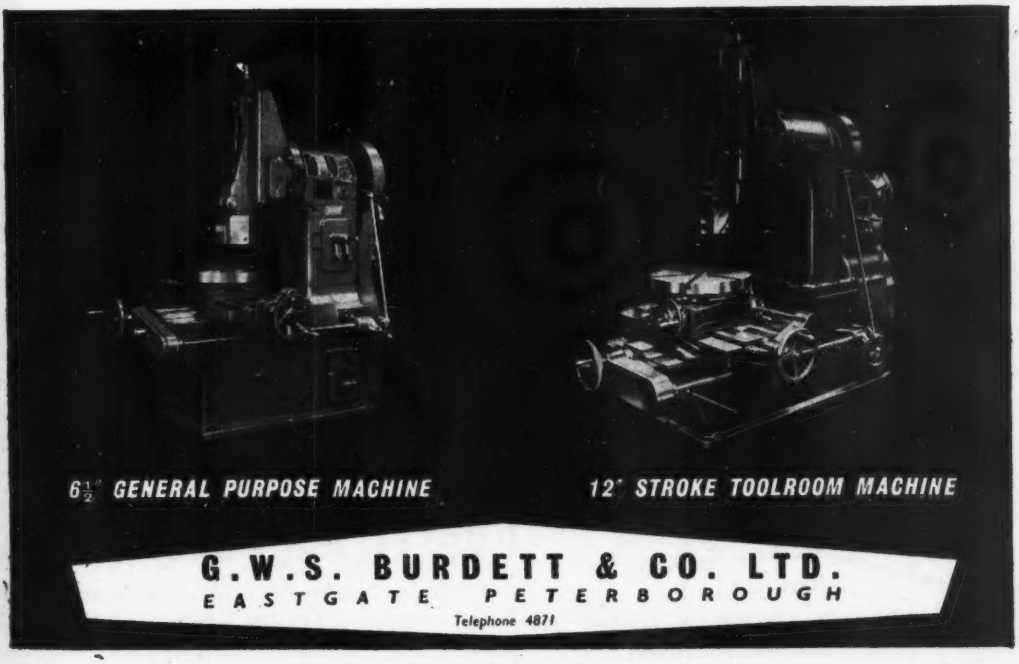

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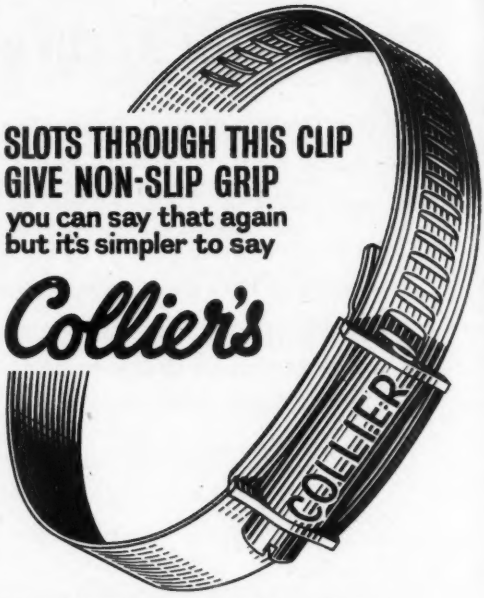

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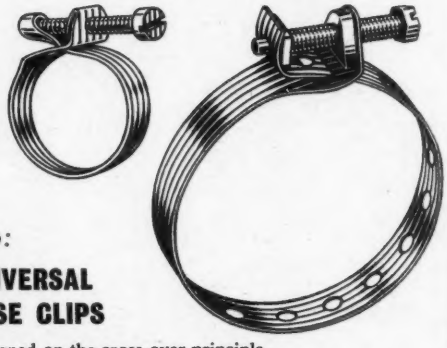

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TYPE 'A': 4 sizes give widest range of adjustment.
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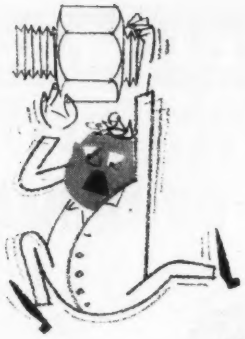

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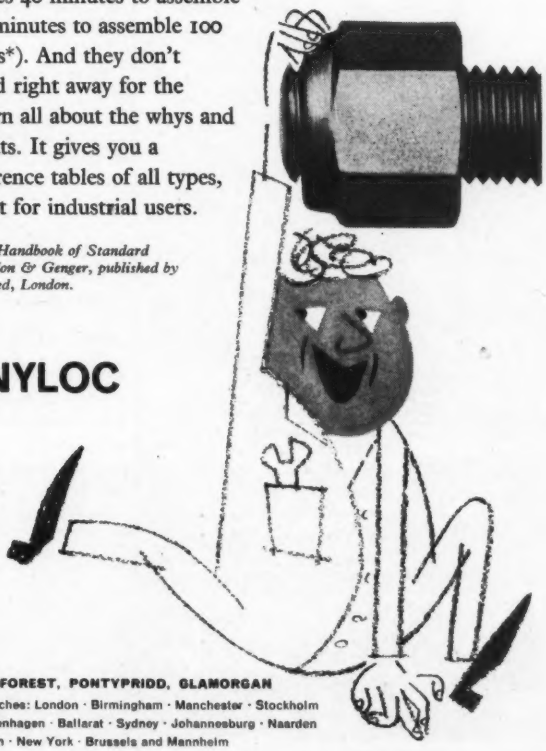
**These times are based on 'The Handbook of Standard Time Data for Machine Shops' by Haddon & Genger, published by Thames & Hudson Limited, London.*



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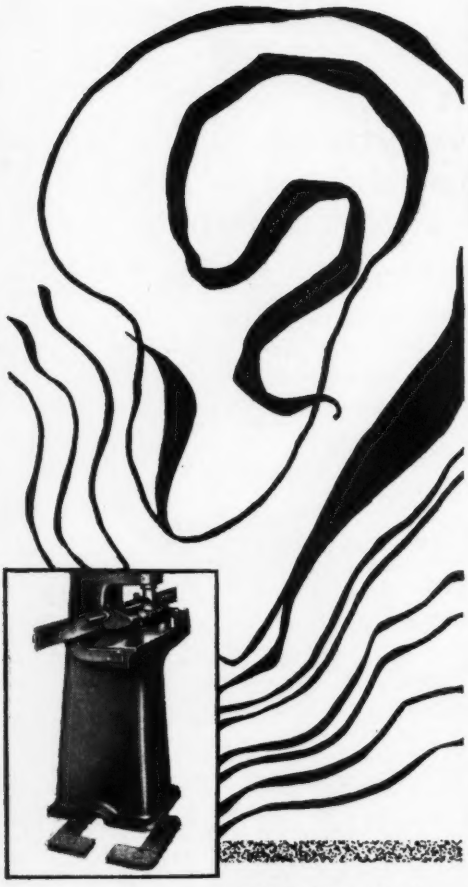

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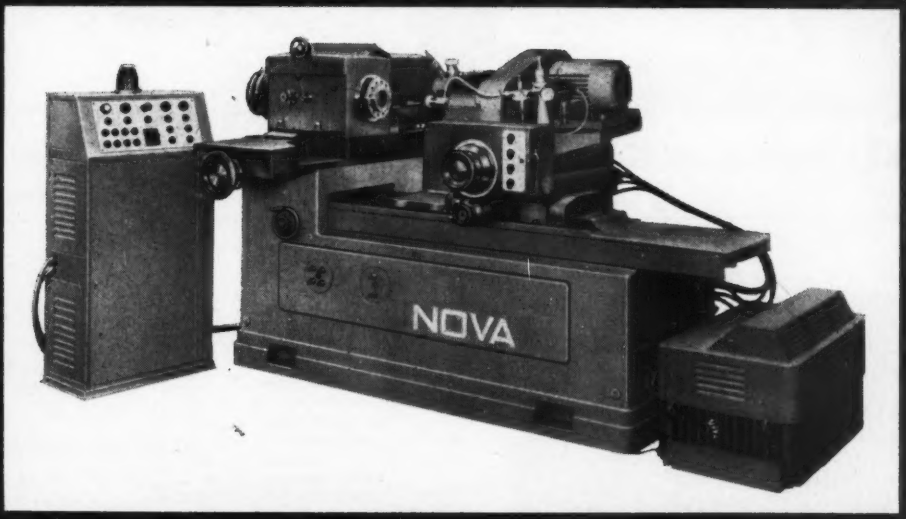

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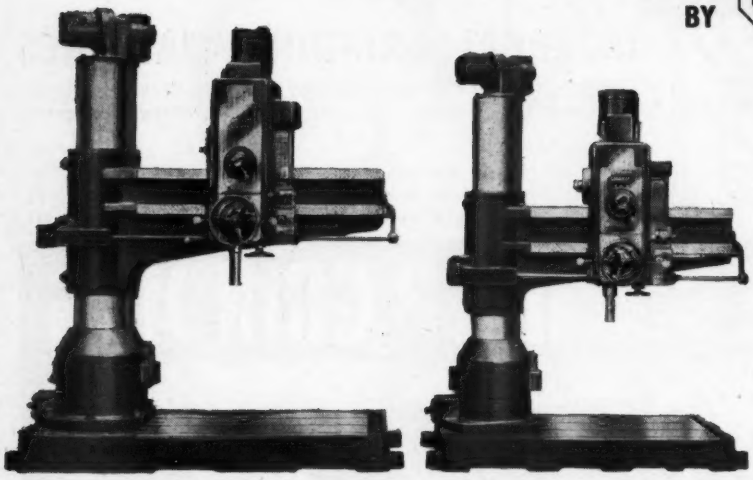

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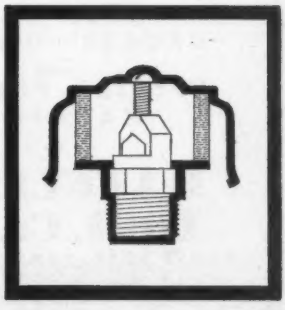

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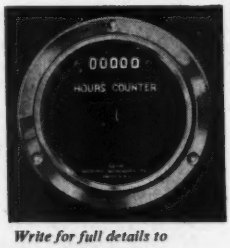

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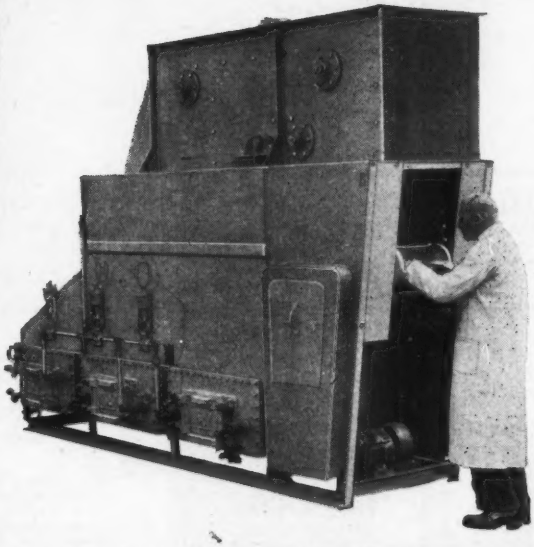

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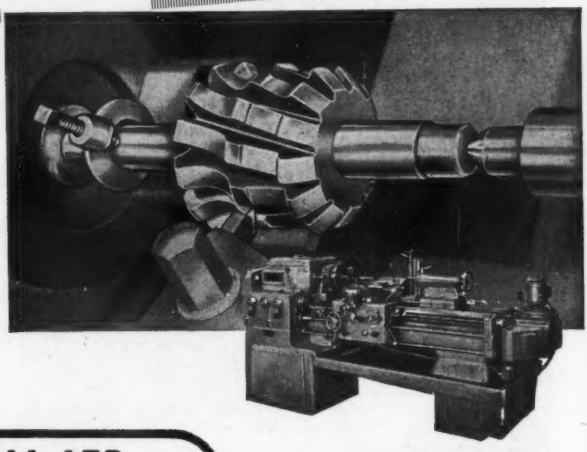

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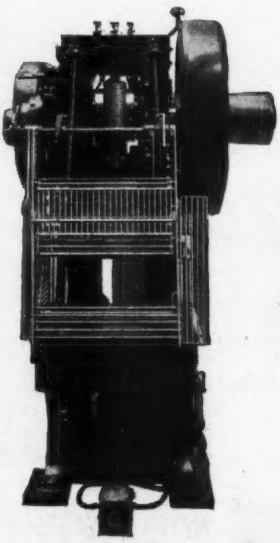

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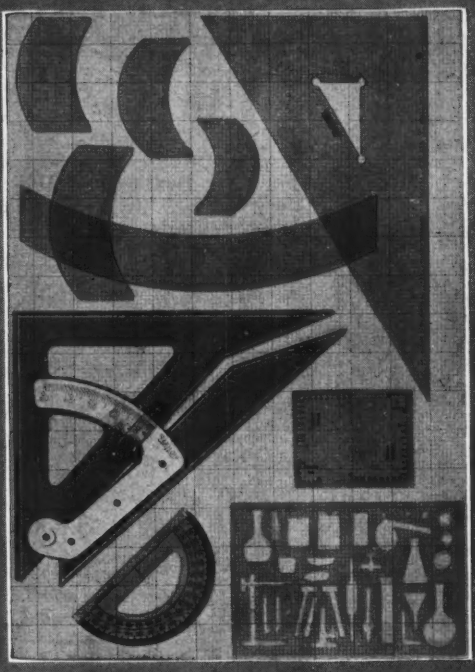

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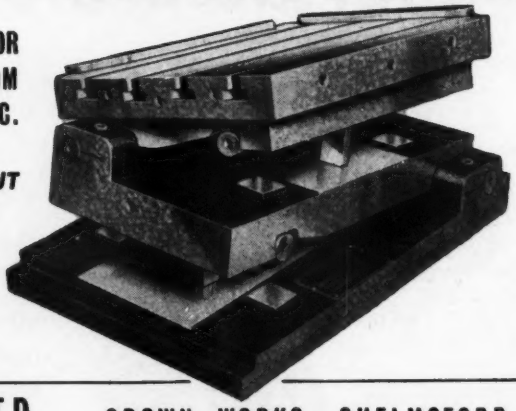

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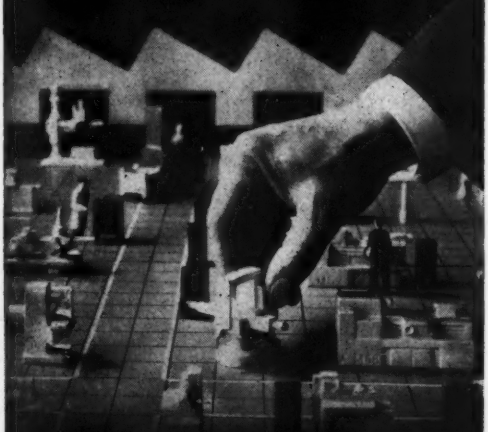

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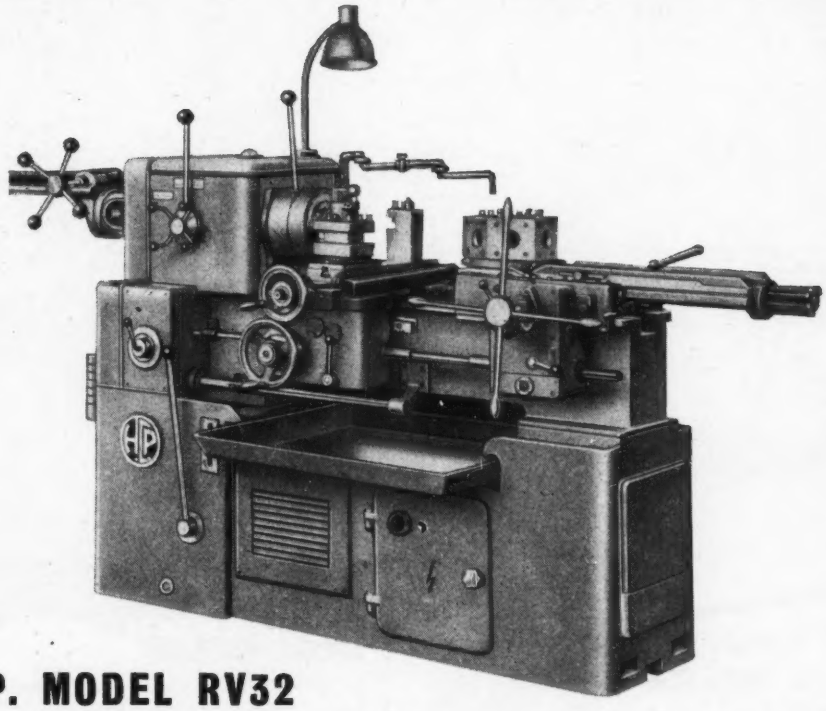

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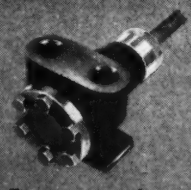
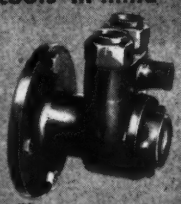

Foot mounted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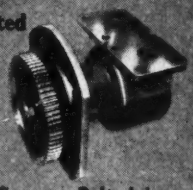
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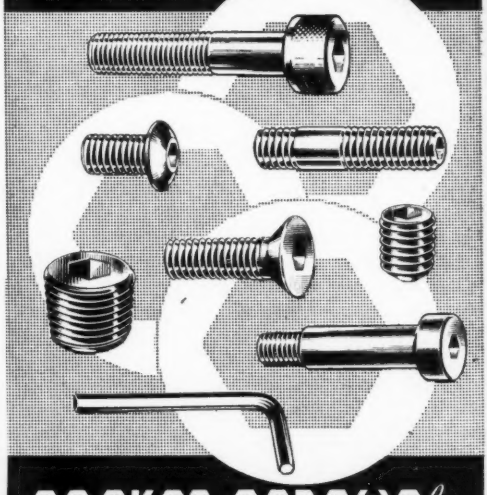

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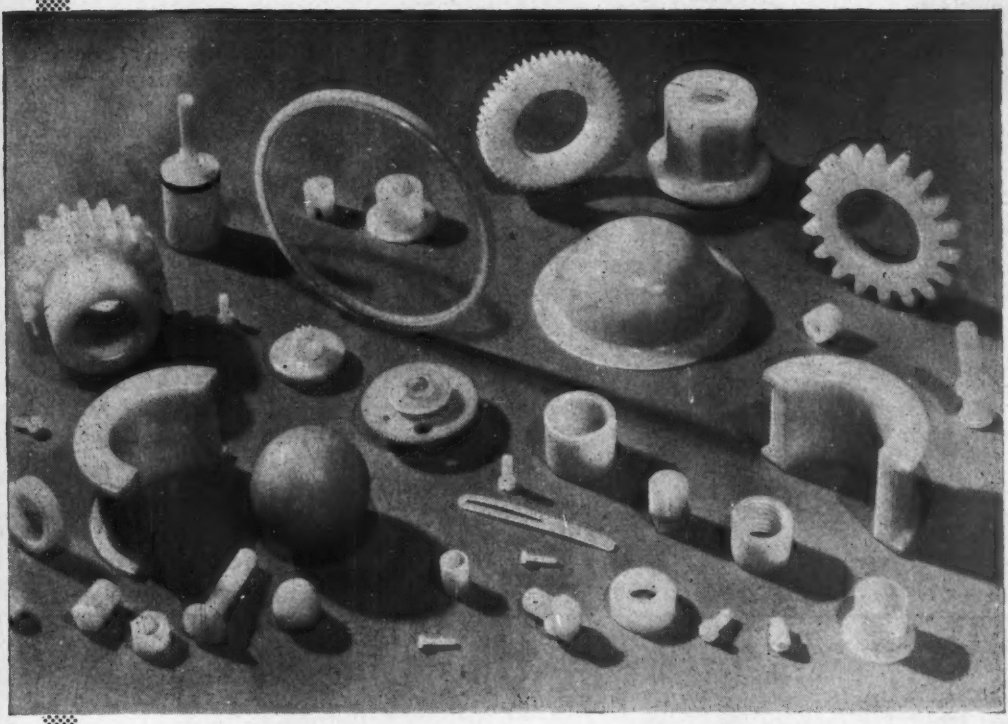

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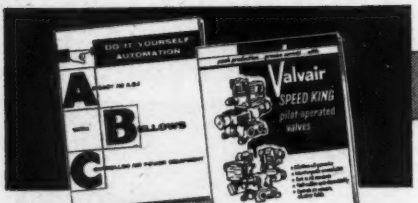

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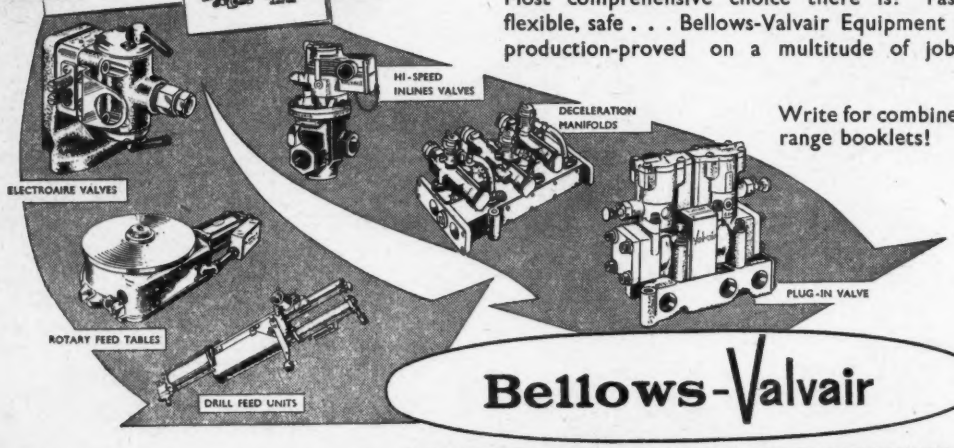

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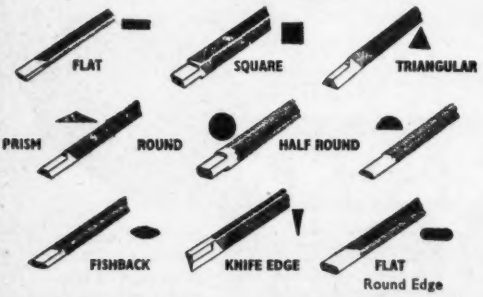

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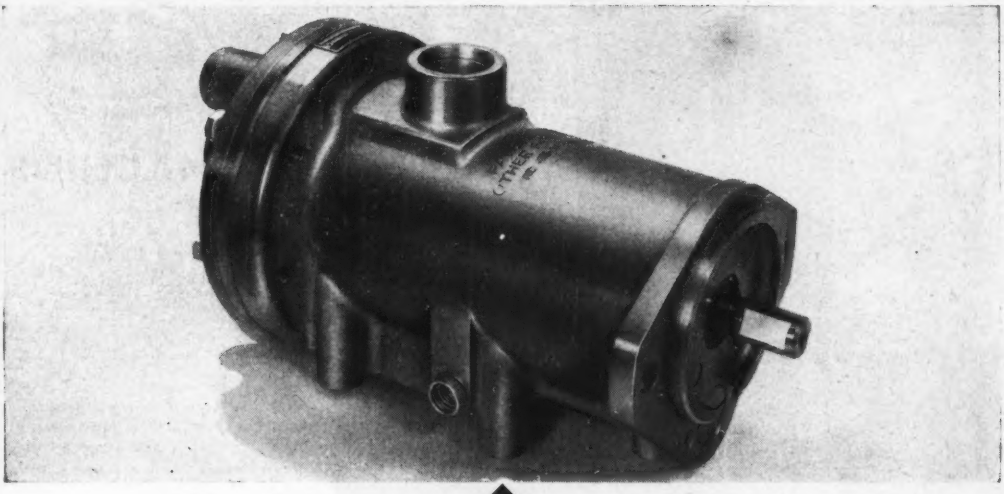

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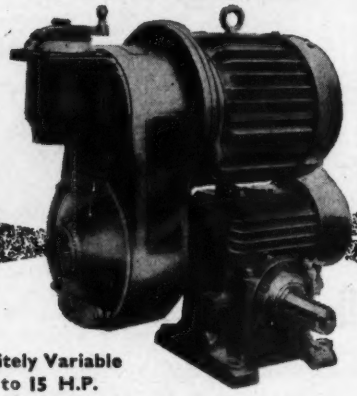

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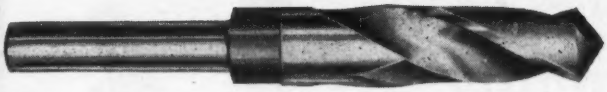

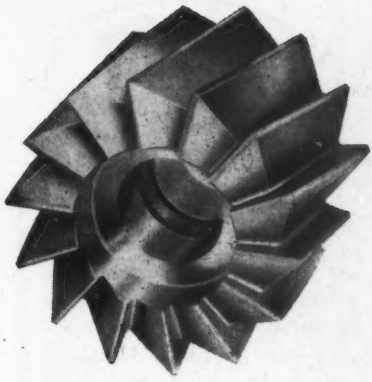

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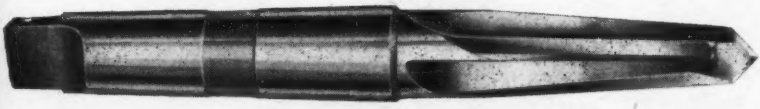

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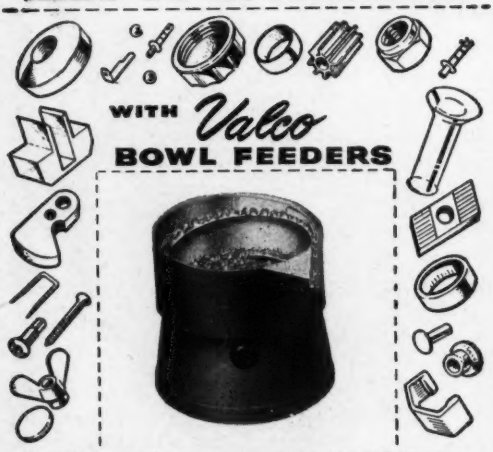

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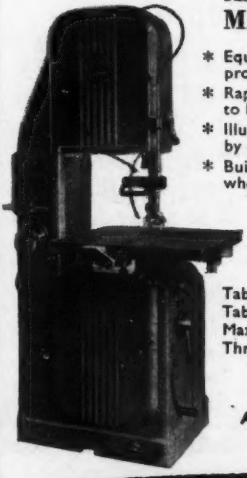

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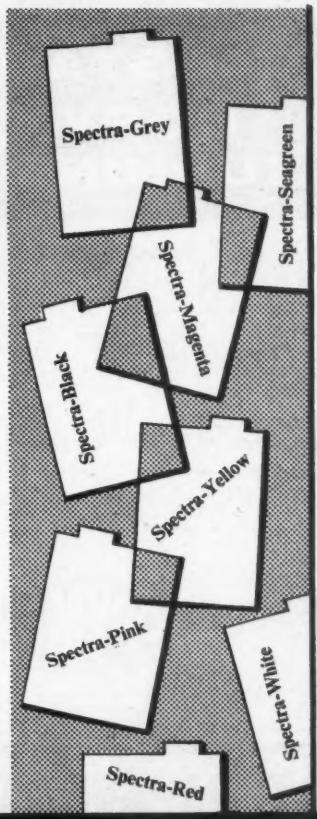

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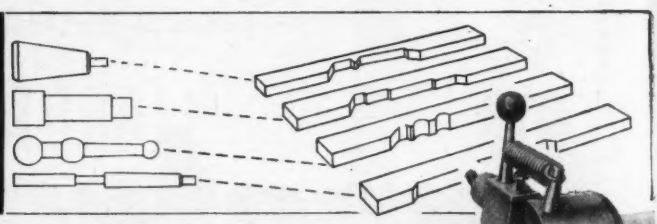

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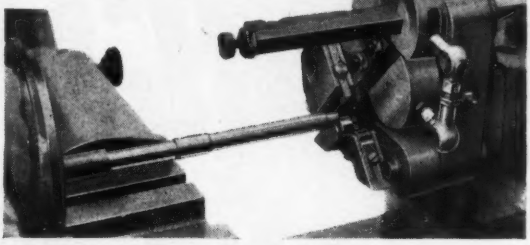

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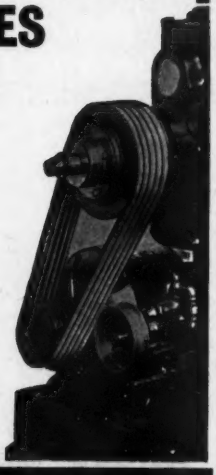

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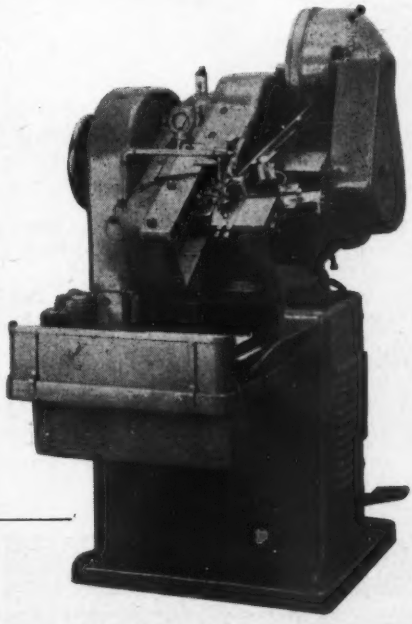

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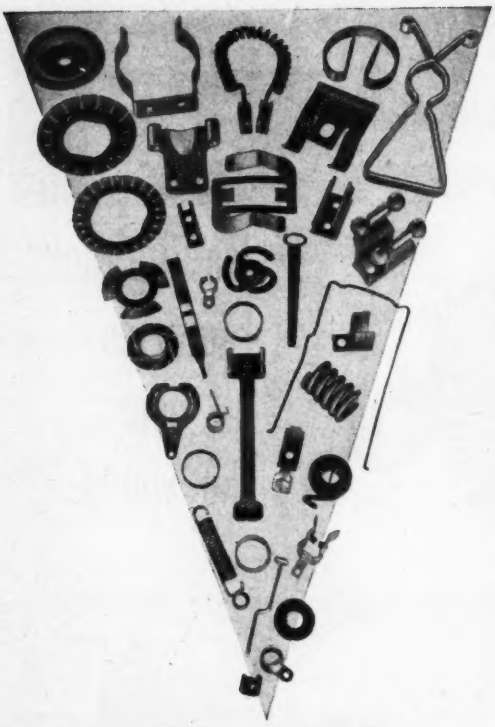

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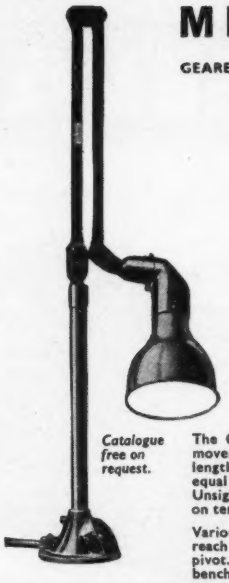

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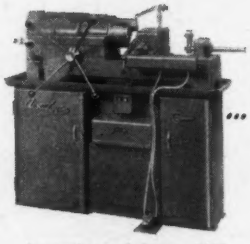

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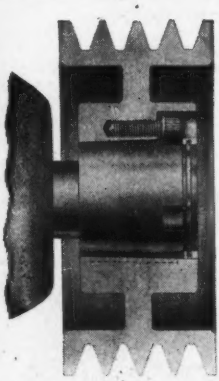

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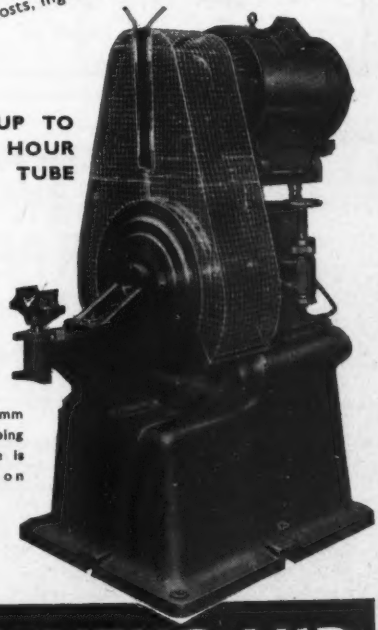

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minutes saved!

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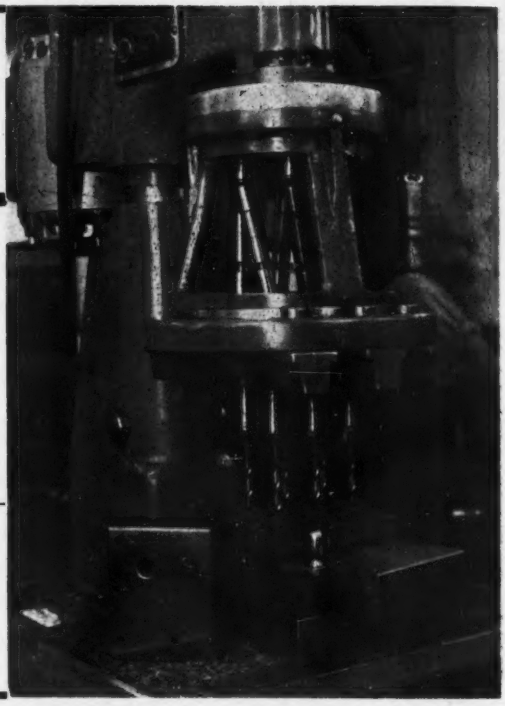

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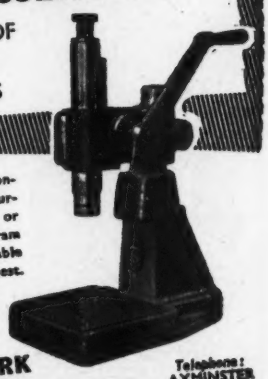

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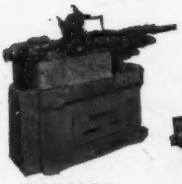
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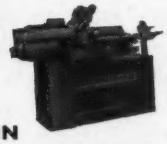
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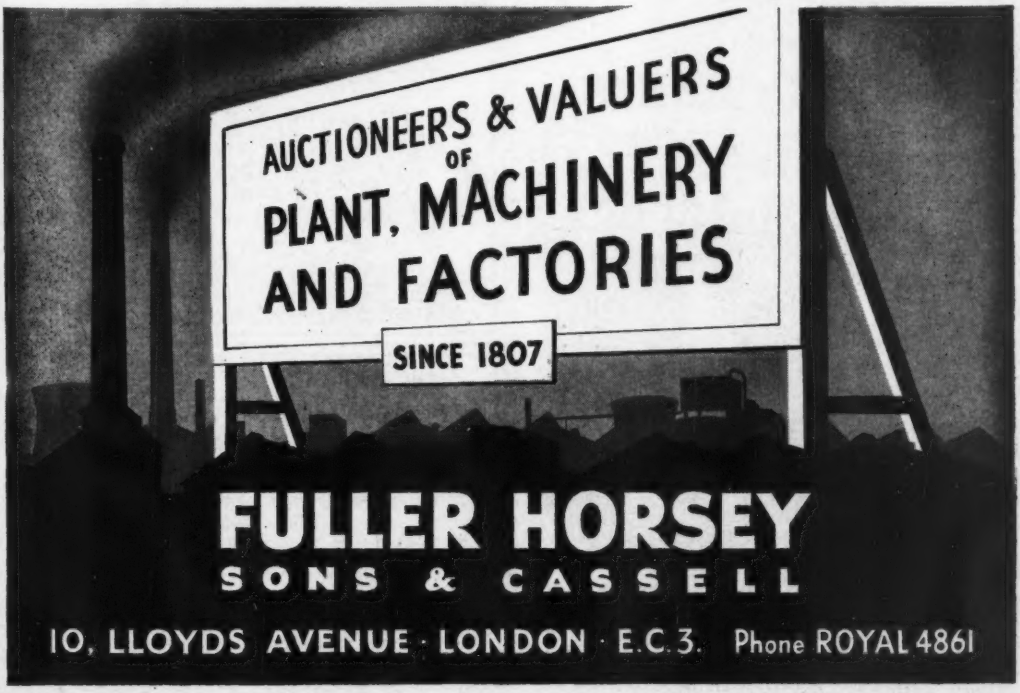

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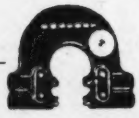

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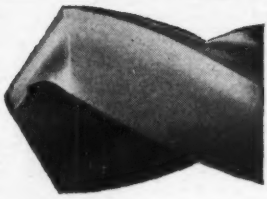

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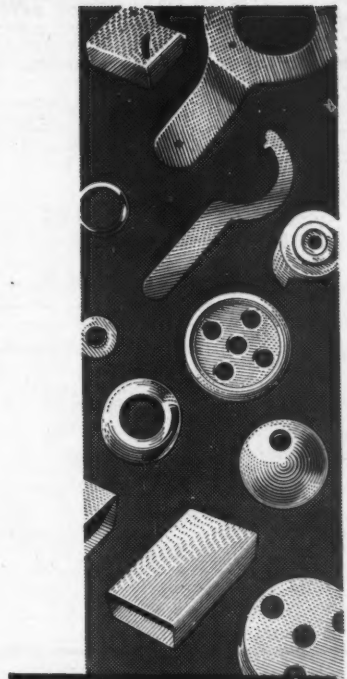

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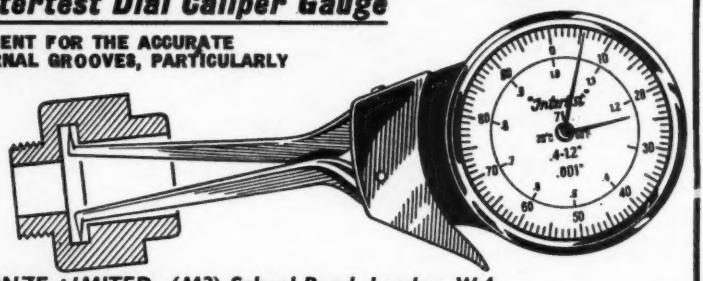

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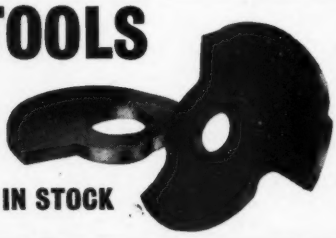

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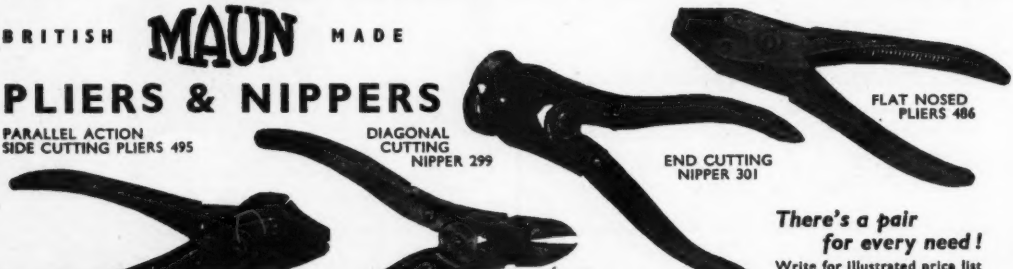

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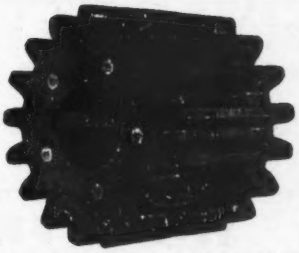

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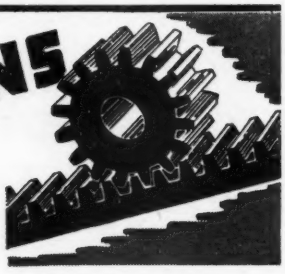

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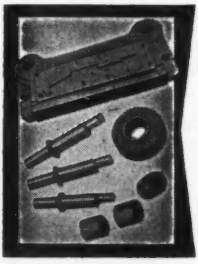

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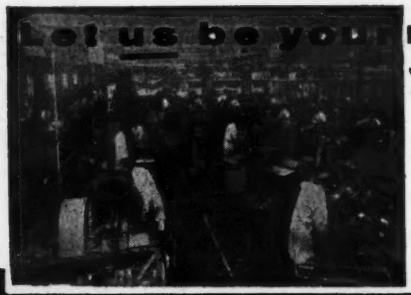

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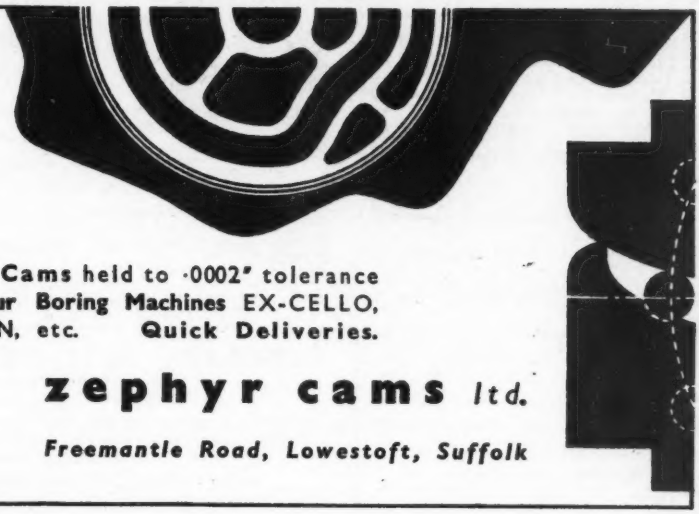

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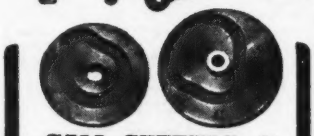

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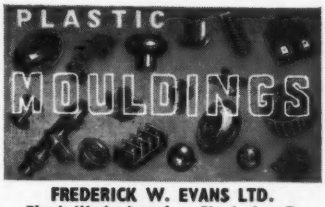

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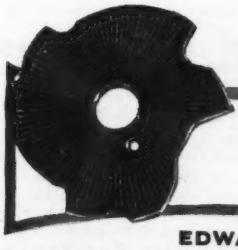

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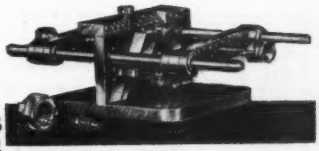
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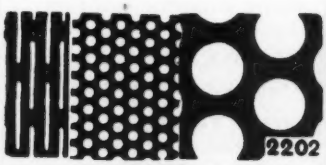

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CARDIFF 9½in Prefect (August)
CARDIFF 11in Crusader (September)
STANLEY 10½in (September)
WILLSON 7½in Mk V (Stock)
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BINNS & BERRY 12½in. (August)
GRAZIANO 7½in. (July)
MYFORD Super 7B (August).
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HARRISON 8½in. (New Model) (August).
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VICTORIA U2 Universal (August).
VICTORIA U3 Universal (July).
VICTORIA O2 Omnimil (July).
VICTORIA V2 Vertical (August).
VICTORIA V3 Vertical (July).
VICTORIA V2 Vertical Rapidmil (July).
RICHMOND No. 3 Vertical (Stock).
BEAVER VBRP Turret Mill (July).
GIEWONT No. 4 Vertical (Stock).
GIEWONT No. 2 Vertical (Stock).
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INDUMA 3U Universal (Sto k).
WOODHOUSE & MITCHELL 309 Turret Mill (July).

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Ward 7 Comb., covered bed.
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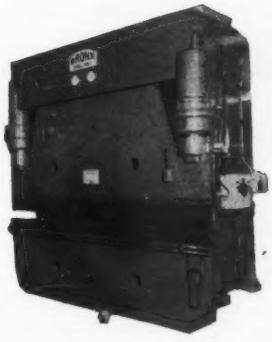

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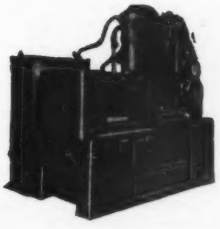

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SHEPHERDS BUSH,
LONDON, W.12.
SHEpherds Bush 4401/2.

Edwards

TAYLOR & CHALLEN Size No. 3½ Double Sided Geared Double Action Cam Action Drawing Press. Motorised for 400-440/3/50 supply. Punch stroke 10in. Blankholder stroke 5½in. Between uprights 22in. Bed 20in. × 10½in. Hole in bed 10in. diameter. Weight approx. 80 cwt.
TWO NEW **LEN.25/220** High Speed Open Fronted Inclinable Power Presses. With adjustable stroke. Motorised for 400-440/3/50 supply. Pressure exerted 25 tons. Depth of throat 8 3/16in. Table 16½in. × 22 7/16in. Hole in table 8½in. Stroke adjustable from ⅛in to 3 7/16in. Weight approx. 35 cwt.
TWO NEW **LEN.40/250** Open Fronted Inclinable Power Presses. With adjustable stroke. Motorised for 400-440/3/50 supply. Pressure exerted 40 tons. Depth of throat 9½in. Adjustment of stroke ⅛in. to 3 3/16in. Table 18½in. × 25 5/16in. Hole in table 8½in. diameter. Weight approx. 58 cwt.
BESCO Model APX Eccentric Power Punching Press. Pressure exerted approx. 8 tons. Stroke adjustable from ½in. to 1½in. Bed 11½in. × 8½in. Hole in bed 4½in. × 3½in. On cast iron table stand.
CRAIG & DONALD 8/35 Double Sided Geared Single Action Power Press. Tie bar construction. Motorised for 400-440/3/50 supply. Capacity 255 tons. Stroke of ram 12in. Between uprights 35in. Hole in bed 29in. diameter.
HORDERN, MASON & EDWARDS Type L20 Inclinable Power Press. Motorised for 400/3/50 supply. Pressure exerted approx. 20 tons. Stroke adjustable from 3/16in. to 3½in. Bed 23in. × 14½in. Hole in bed 9½in. diameter. Weight approx. 29 cwt.
BESCO Model EB6 Eccentric Power Punching Press. Motorised for 400-440/3/50 supply. Pressure exerted approx. 70 tons. Stroke adjustable from ⅛in. to 3½in. Table 26in. × 19in. Hole in table 11½in. × 9in. Weight approx. 50 cwt.
Photographs of the above are available.

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BLANCHARD 18 Surf. Grinder.
VICTORIA U3 Monotrol-Univ. Miller, 1953.
CONOMATIC 8 sp. 1¼in. Bar Auto.
BROWN & WARD ⅝in. and 1¼in. Autos.
WARD 3A Capstans.
HERBERT 4 Senior Capstan.
CLEVELAND 1 1/16in., 1¼in., 2in., 2¼in., 3¼in. Autos.
MASSEY 5 cwt. Press Hammer, 1942.
Three **UNION** ⅜in. Pedestal Drills. NEW.
BULLARD 16in. 6-sp. Mult-au-Matic, 1943
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FELLOWS 61A, 645A Gear Shapers.
BRYANT 16-38 Internal Grinder.
HEENAN-FROUDE Baling Press, 1947.
SCHULER Vertical Dieing Press.
HERBERT 9S Turret Lathe.
MILWAUKEE 2H, 3K Plain Millers.
BLISS 304A 50 ton Press, 4in. stroke.
NORTON 14 × 72 Univ. Grinder.
BROWN & SHARPE No. 3 Univ. Grinder
DEFIANCE 23A Horizontal Borer.
ARCHDALE 38in. Sens. Radial Drill.
NEWALL type L 10in. × 48in. Grinder, 1942
HEALD 72A Internal Grinders (3).
NORTON 12 × 36 Universal Grinder.
WARNER & SWASEY 3, 5 and 2A Turrets.
PRATT-WHITNEY 12B 2-sp. Profiler, 1941.
EDGWICK No. 2 Universal Miller.
BARNES No. 2 Horizontal Hones (2).
CHURCHILL No. 1 Planetary Grinder.
ORCUTT HM24 Gear Grinder, 1944.
GISHOLT 5 and 1L Turret Lathes, 1941-43.
GRIDLEY Model R, 2¼in. cap. 4-sp. Auto.
ARCHDALE 18in. and 30in. Vert. Mill, 1942.
MONARCH Copying Lathe, 1946.
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All modern fully motorised machines.

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1½in. **CONOMATIC** 4-spindle.

CUTTING OFF MACHINES

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LATHES

SWIFT SENTINEL, Model 10SP. A.G.H./SS & SC. 10in. centres by 5ft. 6in. between. Speeds 30 to 1,000.
CHURCHILL-REDMAN A.G.H./SS & SC. 9in. centres by 6ft. between Gap Bed.
BRADFORD Metalmaster. 7½in. centres by 30in.
DEAN SMITH & GRACE A.G.H./SS & SC. 9in. centres by 4ft. 6in. between.
PRATT & WHITNEY A.G.H. 6½in. by 30in.
EDGWICK A.G.H./SS & SC. 6½in. centres by 30in. between.
TRIDENT Gap Bed Lathe. 6½in. by 60in.
WARD HAGGAS & SMITH faceplate Lathe, 57in. swing, 64in. in gap. Short bed with adjustable gap.

GEAR HOBBING MACHINES

PFAUTER type R00.
MIKRON type 79.
CLEVELAND 130D.

MILLING MACHINES

CINCINNATI, No. 2 Dial Type. Medium speed horizontal.
CINCINNATI 08 Vertical.
THIEL Model 58 Tool Room Mill.
ARCHDALE Horizontal 28in.
WADKIN High Speed Vertical, Table 35in. × 13in.

MILLERS THREAD

HILLE 6in. O/D Max.
MATTERSON No. 11.
HANSON WITNEY 9in. by 4in.
WICKMAN Moulton.
ARCHDALE with 120 Hobs.
WANDERER.

SHAPERS

ESSEX Punch Shaper Microscope and equipment.
ROCKFORD 28in. Hydraulic Universal.
INVICTA 6M 24in.
ALBA 4S 18in.

SLOTTERS

BUTLER RAPID 8in. Tool Room Machine.
BUTLER PRECISION 4in.

CAPSTAN AND TURRET LATHES

WARD No. 7 Capstans.
WARD No. 7 Combination. Serial K.
HERBERT No. 9 Combination. Flat [Bed.
HERBERT No. 4.
HERBERT No. 2S & 1S and O.
HERBERT No. 13 Bar Turret.
GISHOLT 1L A.G.H. Combination.
GISHOLT No. 4 A.G.H. Capstan.
GISHOLT No. 3 A.G.H. Capstan (Collet).
GISHOLT No. 3 Simplified Capstan.
MODERN No. 1.
WARNER & SWASEY No. 1.
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ASQUITH 6-ft. D.C. Variable Speed. Motor Drive.
ARCHDALE Light Sensitive 36in. Rise and Fall Table. No. 3 Morse.
ARCHDALE Deep Hole Drill, 1 & 2 Spindles.
LELAND GIFFORD 2 Spindle, No. 2 Morse.
ASQUITH Horizontal Duplex M/c. No. 5 Morse, 5ft. dia. Rotary table.

GRINDERS—CENTRELESS

SCRIVENER No. 1 Old Type.
SCRIVENER No. 1 Hydraulic, Plunge feed and wheel forming.
B.S.A. No. 9.

GRINDERS—INTERNAL

CHURCHILL, Models HBA, HBB, HBC and HBY.
HEALD, Models 70 and 81.
RIVETT, Model 121.
JUNG, 3in. capacity.
SMART & BROWN 3in. capacity.

GRINDERS—SURFACE

SNOW VB.18, 72in. Traverse by 15in. wide.
SNOW P.24, 24in. by 8in. Hydraulic.
DOALL 24in. by 8in. Hydraulic Feed.
JONES & SHIPMAN Fig. 540. 6in. by 18in.
All Electrics 400/3/50
BLANCHARD 10C. 16in. Mag. Rotary Table.

BROACHING MACHINES

LAPOINTE Vertical 8 tons. 36in. Stroke.
LAPOINTE Horizontal 15 tons 50in. Stroke.
LAPOINTE Horizontal Twin Screw Stroke 40in.

DRILLS

ARCHDALE Snout Type Electrically Controlled Vertical Borer. 50 Int. Taper.

PRESSES

85-ton **RHODES** Upright Geared.
16-ton **RHODES** Inclinable.
25-ton **RHODES** Inclinable.
35-ton **RHODES** Inclinable.
50-ton **RHODES** Inclinable.
60-ton **TAYLOR & CHALLEN** B.3¼. Variable stop up to 4in., with Roll Feed and Chopper.
BLISS No. 8 Power Press.
FLY PRESSES, Nos. 3, 4, 5, 6.
FLY PRESSES Horning, No. 4.

GRINDERS—UNIVERSAL

LANDIS 12in. by 36in.
HENRI KAESER Model L. 10 by 20.

LAPPING MACHINES

HAHN & KOLB 26in. dia. with Coolant Filter Plant.
PETER WOLTERS Hydraulic. Two Spindle Vertical Honing Machine

GRINDERS—CYLINDRICAL

PRECIMAX HUP. 1, 7in. by 10in.
PRECIMAX HUP. 1¼, 7in. by 12in.
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NORTON 10in. by 24in.
KEIGHLEY K Model 6 × 18.

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GRINDERS

JONES & SHIPMAN 540 Surface Grinder.
ROBOT 6in. × 18in. Surface Grinder.
NEWMAN 10in. × 24in. Universal Grinder.
BROWN & SHARPE No. 2 Surface Grinder.
HORSTMANN Thread Grinder, capacity 5in. dia. × 9in. b.c.
BROWN & SHARPE No. 5 Cylindrical Grinder.
FRITZ WERNER Model 270A Cylindrical Grinders, 3½in. × 7in. b.c.
BROWN & SHARPE No. 13 Universal Grinder.
BRYANT No. 5 Heavy Duty Internal Grinder.
BENTLEY Form Cutter Grinder.

LATHES, CAPSTANS

HERBERT No. 4 Capstan Lathes.
WARD No. 10 Turret Lathe.
WARD No. 4 Capstan Lathe.
D.S.G. 8½in. × 30in., 11-490 r.p.m.
HOLBROOK 8in. × 36in., 11-400 r.p.m.
COLCHESTER MASTER 6½in. × 36in. Ainjest Screwing Attachment.
LE BLOND "Regal" 7in. × 40in., 25-500 r.p.m.
BOYES & EMMS S.S. & S.C. Lathe. centre height 16in. × 7ft. 6in.
ROLLO 6½in. Centre Lathe.
RIVET 4in. × 18in. b.c. Precision Lathe.

MILLERS

CINCINNATI 8in. × 18in. Tool and Die Miller.
TRIDENT Vertical, table 30in. × 8in. 75-750 r.p.m.
CINCINNATI 1-18 Production Miller.
KENDALL & GENT Vertical Miller, table 69in. × 19in., speeds 20-300, rapid traverses.
SCHIESS DEFRIES Vertical Keyseater.
MAMMUT 10in. × 23in. Table Horizontal Mill, hand lever operated.
FRITZ WERNER 10in. × 34in. Horizontal Mill.
BROWN & SHARPE No. 2 11in. × 49in. Horizontal Mill, speeds 15-376 Feeds 3/10-15 I.P.M.

PRESSES, SHAPERS, PLANERS AND HOBBERS

BUTLER 14in. Production Slotter.
INVICTA 5in. Shaper.
CHURCHILL-REDMAN 32in. Stroke Heavy Duty Shaper. Excellent condition.
ESSEX No. 32 Punch Shaper.
30-ton **RASKIN** Double Sided Double Geared Drawing Press. Area 20in. × 23in. Draw 4½in.
New **POREBA** Model HDA.80 Planer, capacity 10ft. × 32in. × 30in. table, drive by Heid gearbox.
DOWDING V8 Gear Hobber.

DRILLS

POLLARD 4-spindle Pedestal Drill, 2-2MT, 2-3MT.
POLLARD 3-spindle Pedestal Drill, 3MT, 110-1,455 r.p.m. Power Feed.
POLLARD 13AX Pedestal Drill.
PROGRESS 4E Pillar Drill.
TAUCO ½in. Bench Drill.
BOLEY Multi Drill VB 10in.
CORONA 13in. 2AP Sensitive Pedestal Drill.
CORONA 20in. Pedestal Drill.
15HEF 4 Spindle Drill.

PRESSES

One 50-ton **SEDGWICK** Mechanical Press Brake, 6ft. bending length, two years old.

MISCELLANEOUS

CANNING Double Ended and Centreless Polishing Machines.
CINCINNATI 3/24 Duplex Hydromatic Horizontal Milling Machine. Table working surface 14in. × 40½in. Table travel 24in. 8 spindle speeds 50 to 370 r.p.m. Change wheels. 400/3/50.
NOBLE & LUND 11in./16in. Fluidfeed Cold Sawing Machine with fluid grip vice. Capacity 5in. dia. rounds, 4½in. squares, 3 speeds. 5 h.p. 400/3/50.
PRECIMAX Cylindrical Plain Grinder. Capacity 8in. × 24in. Plunge feed. Coolant tank and fittings. Motorised 400/3/50.
TAYLOR & CHALLEN 4½ G.D.P. Power Press. Punch stroke 15in. Maximum draw 7½in. Largest blank 18in. dia. Distance between uprights 24in. Complete with die cushion and operator's guards. 400/3/50.
TAYLOR & CHALLEN 3½ G.D.P. Power Press. Punch stroke 10in. Maximum draw 5in. Largest blank 14in. dia. Distance between uprights 22in. 400/3/50.
VAN NORMAN No. 12 Sliding Head, Milling Machine. Table size 38in. × 8in. 9 spindle speeds 70 to 1,465 r.p.m. 12 auto feeds ⅛in. to 14in. per min. 400/3/50. Complete with Vertical attachment.
ALEXANDER 2A Universal Die Sinking Machine. Table size 14in. × 8in. Copy table 12½in. × 17½in. Ratio 1½-1 to 10-1. 10 spindle speeds 1,900 to 15,000 r.p.m. Motorised 400/3/50, complete with equipment and Universal Cutter Grinder.
RUSHWORTH Geared Overcrank Power Guillotine, capacity 10ft. × ⅛in. m.s. 20 Strokes per minute. Motorised 15 h.p. 400/3/50. Complete with automatic hold-down, front and rear gauges, fully guarded and spare pair of blades.
BROOKES Overcrank Double Geared Power Guillotine. Capacity 4ft. × ⅛in. Powered work table (in two sections) 24ft. long approx. × 4ft. wide. Motorised 20 h.p. 400/3/50.
RHODES No. 12 Double Sided Double Crank, Geared Power Press. Pressure 75 tons, Fitted fixed stroke 4in. Bed area 44in. × 42in. 400/3/50.

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6in. RPA 8 Spindle Gridley

Chucking Auto complete with Chucks, Cams, Tool Slide Holders, etc. Fully motorised. Excellent condition.

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MITCHELL OF KEIGHLEY 10½in. Type DM10 Gap Bed Lathe by 5ft. 5in. B.C. 400-440/3/50. Instant delivery.
MITCHELL OF KEIGHLEY 12½in. Type DM12 Gap Bed Lathe by 6ft. 9in. B.C. 400-440/3/50. April delivery.
VICTORIA No. 2 Rapidmil Universal Milling Machine. Table size 48in. × 11½in. 400-440/3/50. Instant delivery.
VICTORIA No. V2 Vertical Milling Machine. Table size 45in. × 11in. 400-440/3/50. Instant delivery.

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PACERA MF.2/RC ⅝in. cap. Pillar Drill.
PROGRESS 2G and 2GS ⅝in. cap. Bench and Pillar Drills.
PACERA MB.4 ⅞in. cap. Bench Drill.
PACERA MF.5 1in. cap. Pillar Drill.
ARBOGA E.100S 1in. cap. Pillar Drill.
PROGRESS 3A 1¼in. cap. Pillar Drill.
RICHMOND SR.2 4ft. Arm Radial Drill.
PACERA A.10 ⅜in. cap. Articulated Radial Drill.
RICHMOND HB.3/12 4ft. 6in. Arm Radial Drill.

LATHES

WILLSON NEWEL 7½in. × 3ft. 8in. bet. centres.

MILLING MACHINES

TAYLOR Fixed Head Vertical Mill.
VARNAMO FU.2 55in. × 13in. Universal Mill.
VICTORIA U.O 36in. × 9in. Universal Mill.
VICTORIA O.2 Omnimil Combined Horiz. and Vert. Mill.
AUERBACH Lever Operated Plain Mill.

MISCELLANEOUS

B.E.N. VR.15 Compressor.
B.E.N. VR.32 Compressor.
B.E.N. VR.41 Compressor.
DENBIGH No. 6 Standard Fly Press.
DENBIGH No. 3 Standard Fly Press.
NORTON No. 8 Deep Throat Fly Press.

SELECTION OF OUR NEW MACHINES FOR EARLY FORWARD DELIVERY

VICTORIA V.3 Vertical Mill. July, 1961
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BURDETT 70 18in. × 6in. Hydr. Surf. Grinder. Sept., 1961
JAKOBSSEN SJ.12 24in. × 10in. Hydraulic Surface Grinder. Aug., 1961
CARDIFF 7½in. × 40in. S.S. & S.C. Lathe. July, 1961
COLCHESTER 8½in. Mascot S.S. & S.C. Lathe. Aug., 1961
KERRY AG.2 5½in. S.S. & S.C. Lathe. Aug., 1961
SMART & BROWN 1024 Toolroom Lathe. Oct., 1961
WILLSON 7½in. Newel Mk.V S.S. & S.C. Lathe. July, 1961
WOODHOUSE & MITCHELL 7in. 70 Junior Lathe. Aug., 1961
DENBIGH D.4 Horizontal Mill. July, 1961
INDUMA VR.3 Vertical Mill. Sept., 1961
MILNES Vertical Mill. Oct., 1961
RICHMOND No. 3 Vertical Mill. Sept., 1961
VICTORIA U.2 Rapidmil Mill. July, 1961
VICTORIA TV.1 Turret Mill. July, 1961

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FROM STOCK

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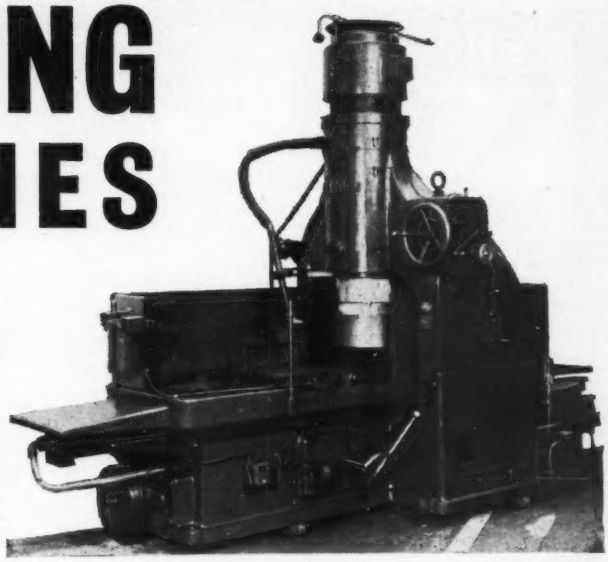

LUMSDEN Model 70 L.E.O.D. Bridge Type Vertical Spindle Surface Grinding Machine. Table size 12in. by 48in. Hydraulic table traverse. 14in. dia. segmental grinding wheel. With magnetic chuck. Motor Drive 400–440/3/50.

At LONDON. **Price: £2,150.**

KELLENBERGER No. 51 Universal Grinding Machine. 9in. by 40in. between centres. 9 table speeds 5·5 to 73·25 i.p.m. Four workhead speeds 65 to 400 r.p.m. With internal spindle. Motor drive 400/3/50.

At LEEDS. **Price: £775.**

JONES & SHIPMAN Model 1001 Type EN Plain Cylindrical Grinding Machine. 12in. swing by 27in. between centres. Hydraulic table traverse. Separate motor drive to workhead giving speeds 40 to 320 r.p.m. Motor drive 400–440/3/50.

At LONDON. **Price: £1,275.**

LUMSDEN Model 71 L.E.O.D. Bridge type Vertical Spindle Surface Grinding Machine. Capacity 60in. by 18in. Hydraulic table traverse. 20in. dia. segmental grinding wheel. With magnetic chuck. Motor drive 400/3/50.

At LEEDS. **Price: £2,750.**

(ILLUSTRATED ABOVE.)

NORTON Horizontal Spindle Surface Grinding Machine. Table size 18in. by 6in. Hydraulic table traverse. With magnetic chuck. Motor drive 400/3/50.

At LEEDS. **Price: £400.**

JONES & SHIPMAN Model 310 Tool and Cutter Grinding Machine. Capacity 8in. by 19in. between centres. 2 speeds to swivelling wheelhead 3,600 and 5,000 r.p.m. With various items of equipment. Motor drive 400/3/50.

At LONDON. **Price: £350.**

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Classified Advertisements (*PLANT FOR SALE, contd.*)

Newman

AUTOMATICS

BULLARD Multi-Au-Matic 7in. 8 spindle.
BULLARD Multi-Au-Matic 12in. 6 spindle.

BORING MACHINES

UNION Model BFT 100 Horizontal Boring and Facing Machine, 4in. diameter travelling spindle (1955).
KEARNS No. 3 Horizontal Boring and Facing Machine, 3½in. diameter travelling spindle.
KEARNS Model OC Horizontal Boring Machine, 3in. dia. travelling spindle.
KEARNS No. 4 Horizontal Boring and Facing Machine, 4in. diameter travelling spindle.
WEBSTER & BENNETT Vertical Boring Machine, table 50in. diameter.
RICHARDS Type PRT Horizontal Floor Boring Machine, 3½in. travelling spindle, 28in. diameter facing head.
GIDDINGS & LEWIS No. 45 Horizontal Boring Machine, 5in. diameter travelling spindle.

CAPSTAN AND CENTRE LATHES

CHURCHILL-REDMAN Model 13NM Heavy-Duty S.S. & S.C. Gap Bed Centre Lathe, 13in. centre height × 72in. between centres. Swing in gap 50 in.
MITCHELL Model DM10 S.S. & S.C. Gap Bed Centre Lathe, 10½in. centre height × 7ft. 5in. between centres. (NEW).
OLDFIELD & SOHOFIELD Surfacing and Boring Lathe, 10½in. centre height.
WARD 7B Combination Turret Lathe.
NILES Heavy Duty Centre Lathe, S.S. & S.C. 17in. centre height × 26ft. between centres.
U.L.R.O. Heavy Duty Centre Lathe, 16in. centre height × 30ft. between centres.

DRILLING MACHINES

HETTNER Radial Drilling Machine, 10ft. elevating arm.

GEAR MACHINES

ORCUTT Model HM24 Hydraulic Internal Gear Grinder.
GLEASON 3in. Straight Bevel Gear Generator.

GRINDING MACHINES

CHURCHILL Plain Cylindrical Grinding Machine, 26in. swing × 84in. between centres (1951).
LANDIS Type C Plain Hydraulic Cylindrical Grinding Machine, 6in. swing × 18in. between centres.
ORCUTT Model HM24 Internal Spur Gear Grinding Machines.
CHURCHILL Plain Hydraulic Cylindrical Grinding Machine, 20in. swing × 72in between centres.
BROWN & SHARPE Plain Cylindrical Grinding Machine, 10in. swing × 36in. between centres.

MILLING MACHINES

CINCINNATI No. 3 High Speed Dial Type Vertical Milling Machine (1950).
CINCINNATI Model 5/72 Plain Hydromatic Milling Machine, table 94in. × 22in. (1952)
CINCINNATI No. 2L Plain Horizontal Milling Machine, table 52in. × 10in.
CINCINNATI No. 1M Vertical Milling Machine.
CINCINNATI No. 4 Dial Type Horizontal Milling Machine.
PRATT & WHITNEY Model BL3620 3-spindle "Keller" Die Sinking Machine.
CENTEC Model 3R Automatic Production Milling Machine, table 25in. × 16in.

MISCELLANEOUS

LANGE & GAILEN 28in. stroke Double Headed Hydraulic Shaping Machine.
TAYLOR & CHALLEN Double Sided 50-ton Geared Power Press, 10in. stroke.

NEWMAN INDUSTRIES LIMITED

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RICHMOND 0.1 Horizontal 30in. × 8in.
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BESCO 20 ton.
WARD 20 ton.
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HELLER Automatic Thread Millers (4).
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MURAD Model 3Q ¾in. Capstan Lathe.

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CROWTHORNE 10½in. Lathe.
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MATRIX No. 6 Internal Thread Grinders, 3in. by 10in.
HEALD Model 81 Sizematic Internal Grinder.
WOLTERS Model I.L.1 Hydraulic Internal Lapping Machine.
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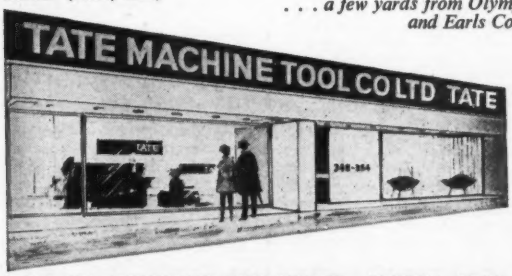

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ASQUITH HK5 Horizontal Keyseating and Cottermill for keyways up to ⅜in. × 15in. Max. dia. shaft admitted 3in. Table working surface 60in. × 10½in. 3 spindle speeds. H.P. motor 4. Excellent condition and guaranteed. £560—a bargain !

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SCRIVENER No. 2 Centreless Grinding Machine, 6in. width of wheel.

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Used **PRECIMAX** Type UPJ12/72 Hydraulic Universal Cylindrical Grinding Machine with variable speed workhead and electrics to suit 400/3/50.
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HERBERT ⅜in. No. 1 Flashtapper.

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CAPSTAN & TURRET LATHES & AUTOS

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WARNER & SWASEY 3A Turret Lathe; 4¼in. hollow spindle, 23¼in. dia. swing over bed covers.
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HERBERT No. 12 Combination Turret Lathe; roller bearing spindle; covered vee bed, swing over bed 23¼in.; hollow spindle 6¼in. dial, good equipment; chasing saddle with automatic sliding and surfacing feeds.
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WARD No. 7 Combination Turret Lathe, 14¼in. swing, 2¼in. hollow spindle, speeds 13-520 r.p.m. Chasing saddle, ball chuck.
No. 12 RYDERMATIC three slide Vertical Multi-tool Lathe; maximum swing 20in.; maximum length 16in.; vertical slide stroke 8in.; horizontal slide stroke 5¼in.

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TOWN 5ft. Radial Drilling Machine; spindle No. 5 Morse taper; speed 26-580 r.p.m.
TOWN 8ft. Non-elevating Arm Radial Drill, with box bed, 122-790 r.p.m.
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SECIC (Swedish) 27in. Radial Drilling Machine 1¼in. capacity, speed 80-890 r.p.m. (New).
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TATE

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LEE & CRABTREE 35 Double Action Mechanical Press.
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INDEX TO ADVERTISERS

	PAGE
Abbey Heat Treatments Ltd.	138
A.B.M.T.M. Ltd.	*Advts.* 32 & 33
Abwood Machine Tools Ltd.	*Advt.* 9
Acbars Ltd.	*Advt* 50 & 160
Ackworthie, John Ltd.	*Advt.* 15
Adams, Cyril & Co. Ltd.	*Advt.* 16
Aircraft Unit Eng'g. Co.	140
Alleyne Foster Eng. Co. Ltd.	139
Almco Supersheen Division of G.B. Ltd.	*Advt.* 37
Archdale, James & Co. Ltd.	*Advt.* 44
Ashtead Engineering Co. Ltd.	138
Atkin, W. T. (Tottenham) Ltd.	142
Austin, E. & Sons (London) Ltd.	134
Automation Limited	*Advt.* 47 & 88
Avenue Engineering Co., The	137
Aylesbury Turned Parts (True Screws) Ltd.	140
Barber & Colman Ltd.	*Inside Back Cover*
Beakbane, Henry (Fortox) Ltd.	94
Bell, H. (Machine Tools) Ltd.	148, 156 & 165
Bellows-Valvair Ltd.	120
Benton Engineering Co. Ltd., The	138
Beryllium & Cooper Alloys Ltd.	92
Bishop Eaves & Sons Ltd.	*Advt.* 8
Boneham & Turner Ltd.	124
Bosch, Ltd.	*Advt.* 20
Brasshouse, Peter Ltd.	106
Brierley, Z. Ltd.	143
British Oxygen Co. Ltd.	75
Britcol	108
Brooke Tool Automation Ltd., The	*Advt.* 3
Broom & Wade Ltd.	*Advt.* 49
Brown & Ward (Tools) Ltd.	*Advt.* 29
Brown's Engineering Works	139
Bryce, Ltd.	141
B.S.A. Tools Ltd.	*Advt.* 55
Buck & Hickman Ltd.	*Advt.* 10
Buck & Ryan Ltd.	122
Bullows, Alfred & Sons Ltd.	*Advts.* 27 & 28
Burdett, G. W. S. & Co. Ltd.	103
Burnerd, F. & Co. Ltd.	*Advt.* 6
Burton, Griffiths & Co. Ltd.	*Advt.* 55
Butcher, Henry & Co.	147
Butterworth British Automatic Machine Tool Co. Ltd.	97
B.X. Plastics Ltd.	113
Carne, Rudolph & Co. Ltd.	*Advt.* 41
Carobronze Ltd.	98 & 134
Carron Co.	*Advt.* 30
Cashmore, John Ltd.	150
Catmur Machine Tool Corporation Ltd.	96
Centaur Tool Works	158, 162 & 164
Chatwin, Thomas & Co.	114
Clarkson (Engineers) Ltd.	*Advt.* 17
Clifton & Baird Ltd.	122
Cohen, Geo. Sons & Co. Ltd.	159
Collier & Collier Ltd.	104
Cooper & Co. (Birmingham) Ltd.	106
Coventry Grinders Ltd.	137
C.P.E. Ltd.	136
Cross Manufacturing Co. (1938) Ltd.	118
Croydon Tool & Case Hardening Specialists Ltd.	137
Dawson Bros. Ltd.	111
Delancey Tool & Engineering Works Ltd.	139
Denhams Engineering Co. Ltd.	*Advt.* 35
Desoutter Bros. Ltd.	70
Diagrit Diamond Tools Ltd.	*Advt.* 53
Dimco (Gt. Britain) Ltd.	156
Donovan Electrical Co. Ltd., The	144
Douglas, A. Co. Ltd.	146 & 158
Dowding & Doll Ltd.	*Advts.* 36, 38 & 39, 92 & 112
Dowling, David Ltd.	94
Drummond-Asquith Ltd.	84 & 85
Dunbar & Cook Ltd.	96
Dyas & Fowle	137
Eagle Milling Co. Ltd.	136
Eclipse Foundry & Engineering Co. (Dudley) Ltd.	137
Economic Stampings Ltd.	141
Edmonton Tool & Eng'g. Co. Ltd.	143
Edwards, Albert (Machinery) Ltd.	145 & 149
Edwards Bros.	139
Edwards, F. J. Ltd.	145, 148, 149, 156 & 163
Eeseset Gauges Ltd.	132
Elgar Machine Tool Co. Ltd.	*Advt.* 21, 130 & 152
Elliott, B. (Machinery) Ltd.	102 & 149
English Electric Co. Ltd., The	77
Evans, Fredk. W. Ltd.	139
Eyre Smelting Co. Ltd., The	132
Fairey Eng'g. Ltd.	121
Fenter Machine Tools Ltd.	107
Fletcher Miller Ltd.	*Advt.* 56
Forrest, W. & Co. Ltd.	145 & 147
Forst Broach Co. (G.B.) Ltd.	*Advt.* 2
Frye Machine Tool Co. Ltd.	146 & 163
Fuller, Horsey, Sons & Cassell	131

(Continued on page 168)

INDEX TO ADVERTISERS—*(continued from page 167)*

PAGE

G.A. Precision Products Ltd. 141
Gate Machinery Co. Ltd. ..... 124 & 158
General Engineers Supply Co. (1937) Ltd., The 143
Graepel, H. Ltd. 143
Granby, Paul & Co. Ltd. ..... 62 & 63
Gray, R. O. 153
Griffiths, Gilbert, Lloyd & Co. Ltd. 133
Grinston Electric Tools Ltd. 90
G.R.M. Heat Treatments Ltd. 137
Grosvenor Works (Holloway) Ltd. 143

Habit Diamond Tooling Ltd. ..... *Advt.* 19
Hessler Sales 134
Hammond Eng'g. Co. Ltd., The 144
Harper, John & Co. Ltd. ..... *Advt.* 7
Harvey, G. A. & Co. (London) Ltd. .. *Advt.* 51
Harvey-Hood Eng'g. Co. Ltd. 136
Heap, Joshua & Co. Ltd. 87
Heliot 161
Herbert, Alfred Ltd. *Advts.* 23 & 25 & *Back Cover*
High Frequency Heat Treatment 136
High Speed Service Tool Co. Ltd. 137
Highbury Metal Spinning Co. (1955) Ltd... 141
Higher Speed Metals Ltd. ..... *Advt.* 34
Hoffmann Manufacturing Co. Ltd., The *Advt.* 12
Holly Engineering (Drayton) Ltd. 143
Hunt, Herbert & Sons Ltd. 133
Huntley & Sparks Ltd. 139
Hurlock, Wm. Jnr. Ltd. 147

Ide, C. F. Engineering Ltd. 132
Ideal Hardening Co. Ltd. 136
Imperial Chemical Industries Ltd. 119
Impregnated Diamond Products Ltd. *Advt* 40
Industrial Trading Co. Ltd. 144

J.B. Machine Tool Co. Ltd. .. 146, 149 & 156
Johansson, C. E. Ltd. 89
Jones, A. A. & Shipman Ltd. ..... 68 & 132
Jones, E. H. (Machine Tools) Ltd. 147 & 151

Kayser, Ellison & Co. Ltd. 80
K. & C. Machinery Ltd. 147
Keir, Alan Ltd. 138
Kelly, R. & Sons Ltd. ..... 147 & 152
Kemp Precision Tooling Ltd. 142
Kenworthy Jig & Press Tool Co. Ltd. 142
K.E.N.T. Machinery & Engineering Co. .. 150
Kirk, Harry Eng'g. Ltd. 154
Kitchen, A.-D. Walker Ltd. 108
Kneller (Instruments & Tools) Ltd. .. *Advt.* 22

Lancing Machine Tools Ltd. ..... *Advt.* 52
Landen (Engineers) Ltd. 135
Lang, John & Sons Ltd. ..... *Advt.* 33
Lattimer, E. R. Ltd. 140
Lawrence, A. & Co. (Machine Tools) Ltd. 146, 148 & 151
Layton, M. C. Ltd. 147
Lench, Thos. Wm. Ltd. 102
Lenchs (Birmingham) Ltd. 104
Leyton Engineering Co. Ltd. 138
Leytonstone Jig & Tool Co. Ltd. *Inside Front Cover*
Liberty Eng'g. Supplies Ltd. 148
Litton's Machine Tool Co. Ltd. 145

MacDowall Equipment Co. Ltd. 142
MacEchern & Co. Ltd. 135
Machine Tool Agencies Ltd. ..... *Advt.* 42
Marsden & Shiers Ltd. 138

PAGE

Marsden, W. G. Engineering Ltd. 138
Martin Bros. (Machinery) Ltd. 154
Maun Industries Ltd. 134
Maysmith Eng'g. Co. Ltd. 142
Meddings, W. J. Ltd. ..... *Advts.* 24 & 43
Mek-Elek Engineering Ltd. 128
Melbourne Eng. Co. Ltd. 131
Mercantile Credits Co. Ltd. 83
Midland Machine Tool Co., The 154
Millen, Edwin & Sons Ltd. ..... 146 & 160
Mills, George (Engineers) Ltd. 138
Modern Machine Tools Ltd. 168
Monks & Crane Ltd. 126
Mono Pumps Ltd. 114
Moser Cams & Tools Ltd. 121
Murad Developments Ltd. 90
Murray's (Pretoria) Eng'g. Co. Ltd. 114

Nalsh Bros. & Co. Ltd. 141
Neill, James & Co. (Sheffield) Ltd. .. 76 & 87
Nettlefold & Moser Ltd. 115
Newall Used Machine Division 149
Newman Industries Ltd. ..... 146 & 160
Nickols Automatics Ltd. 100
Norton Grinding Wheel Co. Ltd. ..... *Advt.* 4
Norton, W. E. (Machine Tools) Ltd. 155
Novogage Ltd. 137

O.K. Trading (B'ham Factors) Ltd. 143
Osborn, Samuel & Co. Ltd. 58

Parkes (Machine Tools) Ltd. 147, 148, 149, 150, 151, 154, 158, 160, 161 & 162
Parkin, F. M. (Sheffield) Ltd. 82
Parkinson, J. & Son (Shipley) Ltd. .. *Advt.* 32
Pidgen Bros. Ltd. ..... 145 & 162
Pilot Works Ltd. 74
Polarcold Ltd. 141
Pollard, Fredk. & Co. Ltd. 93
Potts, Norman E. (Machinery) Ltd. 160
Precision Heating Ltd. 136
Precision Products (Romford) Ltd. 135
Price Machine Guards Ltd. 112

Raistrick, J. E. Ltd. 147
Randalls (Luton) Ltd. 71
Ratcliffe Tool Co. Ltd. 110
Rawplug Co. Ltd., The .... *Inside Back Cover*
Rayner, Peter Ltd. 122
Redcar Eng'g. Co. Ltd. 140
Renold Chains Ltd. 65
Revolving Centres Ltd. 129
R.J.H. Tool & Equipment Co. Ltd., The .. 112
Rockwell Machine Tool Co. Ltd. *Front Cover & Advts.* 45 & 46 & 120
Rodger, Setterington & Ptns. 135
Rodgers Bros. Ltd. 134
Rollo Industries Ltd. 98
Rolls Tools Ltd. 157
Roth, L. 152
Rowland, F. E. & Co. Ltd. ..... *Advt.* 13
Rubert & Co. Ltd. 126
Ryder, Thomas & Son Ltd. ..... *Advt.* 5
Rye, Claude Bearings ..... 143 & 145

Sales Enterprise Ltd. 149
Sanderson Bros. & Newbould Ltd. .. *Advt.* 26
Schrader's Son, A. 57
Scottish Machine Tool Corp. Ltd. 95
Seton Creaghe Engineering Ltd. 135, 137 & 140
Shand, J. H. Ltd. 130
Sheffield Twist Drill & Steel Co. Ltd., The *Advt.* 14 & 81

PAGE

Shell-Mex Ltd. ..... 72 & 73
Shelmerdine & Mulley Ltd. 140
Simmonds Aerocessories Ltd. 105
Simpson, P. & Co. Ltd. 164
Slack & Parr Ltd. 130
Slingsby, Walter & Co. Ltd. 144
Smith & Grace Ltd. 126
Smiths Industrial Instrument Division 110
Smith & Netherwood Ltd. 140
Song Machine Tools Ltd. ..... 162 & 164
Socket Screws Ltd. 118
Southern Engineering & Machinery Co. Ltd. 146
Spectra Chemicals Ltd. 125
Speed Tools Ltd. ..... *Inside Front Cover*
Spring Steel Productions Ltd. 128
Stalker Drill Works Ltd. 123
Stancroft Ltd. ..... 146 & 158
Stephens, R. & Son Ltd. 142
Stevens & Bullivant Ltd. 129
Stirk, John & Sons Ltd. ..... *Advt.* 18
Swift-Summerskill Ltd. 86
Sykes Machine Tool Co. Ltd. ..... *Advt.* 31

Target Engineering Ltd. 126
Tate Machine Tool Co. Ltd. ..... 161 & 163
Tecalemit Ltd. 109
Thoka Machinery Supplies Ltd. 101
Thompson, Joseph (Sheffield) Ltd. 110
Thompson, Michael S. Ltd. 168
Times Machinery Co. Ltd. 117
Town, Fredk. & Sons Ltd. ..... *Advt.* 48
Townsend-Coats Ltd. 64
Trevena & Glover Ltd. 141
Try Gordon Ltd. 88
Turner, G. H. & Co. Ltd. 135

Universal Ball Bearing Co. 144

Valley Products (Lye) Ltd. 124
Van Moppes, L. M. & Sons (Diamond Tools) Ltd. ..... *Advt.* 54
Vaughan Associates Ltd. 127
Victa Engineering Co. 90
Visual Planning Systems Ltd. 116
Voss Translations 144
Vulcascot (G.B.) Ltd. 116

Wadkin Ltd. 99
Ward, M. (Machine Tools) Ltd. ... 146 & 152
Ward, Thos. W. Ltd. 165
Webster & Bennett Ltd. 69
Wells, A. & Co. Ltd. 142
West Green Tool Co. 142
Westool Ltd. ..... 66 & 67
Whitley, Wm. & Sons Ltd. ..... *Advt.* 11
Wickman Ltd. ..... 78 & 79
Widdowson, Herbert & Sons Ltd. 59, 60, 61 & 148
Wigglesworth, Frank & Co. Ltd. 129
Wild-Barfield Electric Furnaces Ltd. ..... *Advt.* 1
Williams, H., & Sons Ltd. 167
Windley Bros. Ltd. 116
W.J.L. (Machinery) Ltd. 143
Worson Die Cushions Ltd. 114

Young, John S. & Co. Ltd. 100

Zephyr Cams Ltd. 139

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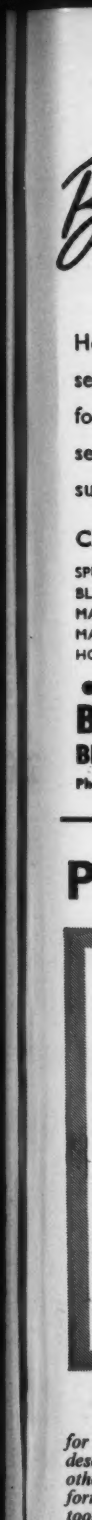

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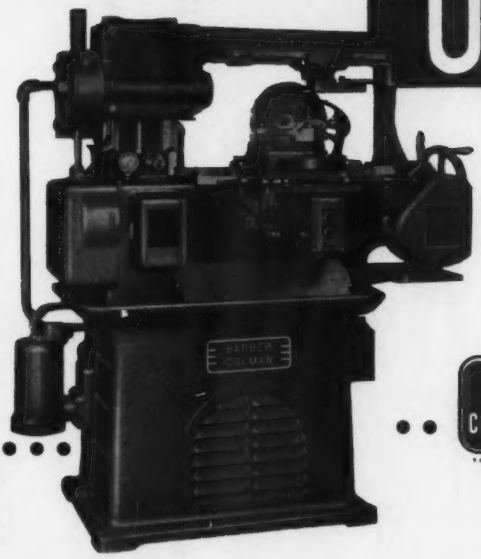

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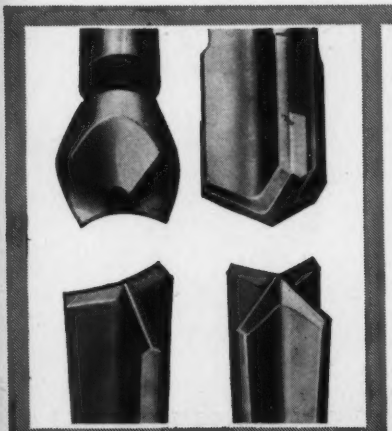

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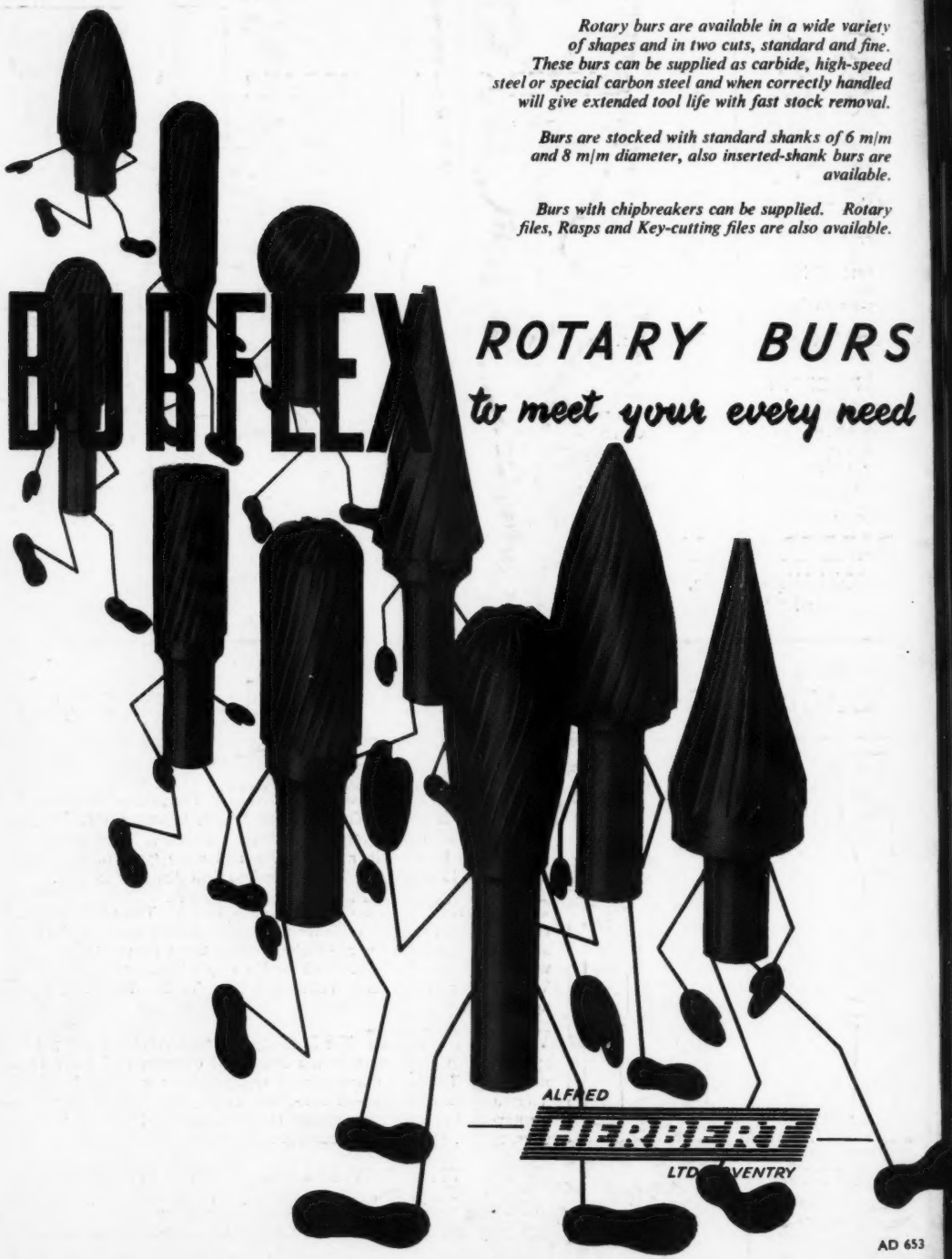

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